Centrífuga DE-1000 De Acionamento De Frequência Variável

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Manual de Manutenção e Operação

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O NÚMERO DE UNIDADE É A CHAVE PARA O SERVIÇO DERRICK

Todos os pedidos para Derrick devem incluir o número da unidade do equipamento. A placa de aço inoxidável do numero da unidade, anexada a cada peça do equipamento Derrick é a chave para um serviço e suporte eficiente.

Típico Número de Unidade Derrick

Esse número único dá informações vitais para o pessoal de serviço que utilizar tais informações para identificação das peças corretas no ato do preenchimento da ordem de serviço, para dar respostas precisas a perguntas de serviços, para o rastreio de documentação, e para traçar o histórico do equipamento ou da configuração. Em suma, o **número** da **unidade fornece as informações vitais necessárias para assegurar que os clientes Derrick recebam o melhor serviço possível.**

O número da unidade é constituído por um prefixo de dois caracteres alfabéticos que identificam o tipo de equipamento e uma série de caracteres numéricos que significam a seqüência de fabricação da máquina. Por exemplo, o número da unidade MA000001 seria a primeira máquina de triagem fabricada por Derrick. Prefixos alfabéticos atualmente em uso são:

MA - Máquina de Triagem	AD - Destiladora e Desareiadora
DG - Desgasificador	AG - Agitador de Lama/pasta
CF - Centrífuga	SF - Moldura de Tela

Para garantir que ele permanecerá intacto ao longo de muitos anos de serviço rigoroso, a placa pesada é rebitada em um membro estrutural, como a estrutura de apoio do vibrador. Não deve ser confundida com qualquer outra identificação na máquina, como um número de série do motor vibrador.

Para um acesso conveniente, o número da unidade também é registrado no Manual de Operação e Manutenção fornecido com o equipamento. Quando

entrar em contato com Derrick para qualquer pergunta ou necessidade, tenha sempre o número da unidade em mãos. É a melhor maneira de conseguir o serviço mais eficiente dos nossos dedicados funcionários de Serviços e Engenharia.

SOBRE ESTE MANUAL

Este documento foi publicado em formato impresso e eletrônico. No manual de formato eletrônico, todas as seções e parágrafos listados no ÍNDICE estão lincados ao texto correspondente.

Navegue no manual eletrônico do seguinte modo:

1. **Para ver quaisquer informações desejadas, exiba a página ÍNDICE e mova o cursor para o título do parágrafo ou seção desejado.**

2. **Para exibir as informações desejadas, clique no título quando o dedo indicador aparecer sobre o texto.**

3. **Quando terminar de visualizar o texto, pressione Alt + tecla de seta para a esquerda para retornar à página do ÍNDICE.**

4. **Se desejar voltar para a mesma informação, pressione Alt + seta para a direita. Para localizar um item diferente, repita as etapas 1 e 2.**

O conteúdo destes documentos está sujeito a alterações a qualquer momento. As informações fornecidas não abrangem todos os detalhes ou variações possíveis do equipamento DERRICK, nem abrange todas as contingências que podem ser satisfeitas em conjunto com a instalação, operação, manutenção ou resolução de problemas do equipamento. Caso seja necessário obter informações adicionais, ou se surgirem situações que não foram abordadas neste manual, trazer o assunto à atenção de seu representante local DERRECK ou ao Departamento de Assistência da Corporação DERRICK em Buffalo, Nova York.

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SEÇÃO 1 - INTRODUÇÃO

VISÃO GERAL

Este manual fornece instruções para instalação e operação da centrífuga DE-1000 de Acionamento de Frequência Variável (VFD) (Figura 1-1). O manual está dividido em várias seções para auxiliar o usuário a acessar facilmente as informações. As instruções incluem descrição, teoria de operação, segurança, instalação e manutenção. Desenhos de referência são fornecidos para facilitar a localização e a encomenda de peças, bem como para a compreensão do funcionamento do equipamento e auxiliar na solução de problemas. O manual também contém documentação técnica fornecida por fontes externas. Estes documentos abrangem componentes utilizados na centrífuga, mas não fabricados pela Derrick.

Figura 1-1 Centrífuga DE-1000 de Acionamento de Frequência Variável (VFD)

SEGURANÇA

A seção 2 deste manual contém informações de segurança pertinentes para tanto operação quanto manutenção deste equipamento. Assegure-se que esta informação seja lida e compreendida por todos os funcionários.

NÃO opere o equipamento em caso de defeito ou falha mecânica ou em componentes elétricos serem detectados.

UTILIZAÇÃO DO EQUIPAMENTO

A centrífuga DE-1000 VFD foi designada expressamente para a remoção de sólidos de lama/pasta de baixa gravidade especifica. Em um tipo de processamento, sólidos são removidos e o líquido é devolvido para recirculação. Alternativamente, os sólidos são retornados para o sistema ativo e o líquido é descartado.

A Corporação Derrick não autoriza nenhuma outra utilização para este equipamento. O uso pretendido do equipamento inclui o cumprimento com a operação, manutenção e procedimentos de segurança inclusos neste manual.

DESCRIÇÃO

Os principais componentes da centrífuga (Figura 1-2) consistem no conjunto rotativo; gabinete de controle, motor de acionamento do recipiente e do transportador, sistema de controle, Sistema de Drenagem, interruptor de vibração; e involucro, base, e Estrado. Os parágrafos seguintes descrevem estes componentes.

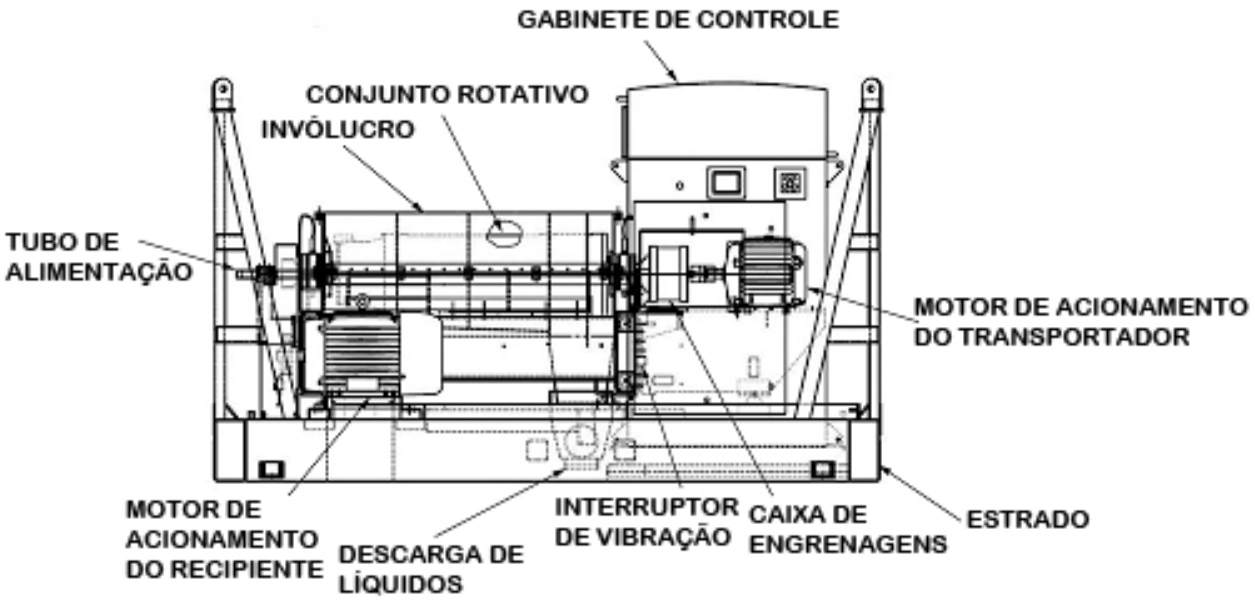

Figura 1-2 Centrífuga DE-1000 VFD, Principais Componentes.

Conjunto Rotativo

O Conjunto rotativo consiste em um reservatório cilíndrico de aço inoxidável, conjunto do transportador contínuo, e componentes relacionados. O Recipiente consiste em um cilindro de aço inoxidável resistente com uma parte cônica na extremidade de descarga e uma parte superior plana do reservatório de líquido na extremidade oposta. Aberturas são fornecidas em ambas as extremidades para permitir as descargas de líquidos e de sólidos. As extremidades do Recipiente são apoiadas por rolamentos de esfera tendo graxeiras para facilitar a lubrificação periódica.

Conjunto do Recipiente

A parte superior do recipiente de líquido na extremidade de descarga de líquidos contém portas efluentes móveis que permitem o ajuste manual do nível de líquido restante no recipiente durante a rotação. Marcas de índice são apresentadas nos poços para facilitar o ajuste preciso. O Nível de liquido ou profundidade do poço, juntamente com outros fatores, ajuda a determinar o teor de líquidos nos sólidos descarregados. O recipiente cônico na extremidade de sólidos forma uma praia inclinada para cima, onde os sólidos são coletados e continuamente descarregados através de portas de saída de sólidos. Peças substituíveis que podem ser descartadas são instaladas no principal recipiente de sólidos protegendo as aberturas de desgastes.

Transportador Contínuo

O conjunto do transportador contínuo é uma cavidade cilíndrica oca, que recebe os dejetos de entrada em seu interior, os dispersa através de bocais de alimentação para o conjunto do Recipiente, e transporta os sólidos para a saída de descarga de sólidos. Girado por um motor elétrico através de uma caixa de engrenagens diferencial, o transportador gira na mesma direção que o recipiente, mas a uma taxa de velocidade menor. A configuração da velocidade diferencial no painel de controle determina a velocidade do transportador em relação à velocidade do recipiente. Esta relação se mantém coerente; assim que a velocidade do recipiente varia, a velocidade do transportador varia proporcionalmente, mas mantem o relacionamento diferencial. Por exemplo, uma velocidade do recipiente de 2000 RPM e uma velocidade diferencial do transportador de 10 tem como resultado uma rotação do transportador de 1990 RPM.

Um eixo de transmissão que se estende através do recipiente principal transfere movimento da caixa de embreagem para o transportador contínuo. O tubo de alimentação inserido através do transportador na extremidade de sólidos dirige a lama/pasta em direção ao acelerador de alimentação, que rapidamente dispersa o material através de bocais de alimentação no transportador contínuo. Inserções de carbonetos nos bocais de alimentação e ladrilhos de carboneto são soldadas às bordas da correia do transportador contínuo pode para dar resistência ao desgaste. Rolamentos de esfera instalados nos pillow blocks têm graxeiras suportando ambas às extremidades do transportador.

Caixa de Engrenagem

A proporção 52:1 de redução diferencial da caixa de engrenagem gira o transportador a uma velocidade menor do que a do conjunto do recipiente. O motor é acoplado à caixa de engrenagem por um acoplamento flexível, que permita a adesão com leves variações de alinhamento. A velocidade de rotação do transportador varia diretamente da velocidade do recipiente, mantendo um relacionamento diferenciado consistente para o transporte de sólidos.

Uma extremidade da caixa de engrenagem é suportada pelos rolamentos do transportador da extremidade de líquidos e a outra extremidade é apoiada pelo motor de acionamento do transportador. O eixo de saída da caixa de engrenagem, acionado pela embreagem planetária de segunda fase, se engatam em ranhuras internas dentro do transportador para transmitir movimento rotativo.

Durante uma condição de sobrecarga, excesso de sólidos no transportador pode sobrecarregar o motor, causando aumento no torque do motor à medida que ele tenta manter as configurações de velocidade diferencial. Se o limite pré-definido do toque do transportador é atingido, o sistema de controle reduz automaticamente a taxa de alimentação para permitir que o transportador limpe os excessos de sólidos. Quando a centrífuga está operando na taxa de alimentação reduzida, a tela Operacional exibe uma mensagem para informar ao operador o status modificado. Se a condição de excesso de torque não for removida, a centrífuga será desligada automaticamente.

Motores de Acionamento

A centrífuga é alimentada por dois inversores de 1800 RPM, trifásicos, motores elétricos à prova de explosão. O motor de 50HP de acionamento do recipiente é transmitido ao conjunto do recipiente por uma polia e séries de correias motrizes, enquanto que o transportador é diretamente acoplado em um motor eletrico de 20HP. Um dispositivo de proteção cobre as polias, correias motrizes e acopladores flexíveis de acionamento do transportador para proteção dos funcionários.

Gabinete de Controle

O gabinete de controle é usado para iniciar, operar e desligar a centrífuga. Todos os controles operacionais e componentes do sistema de detecção necessários para a operação da centrífuga são instalados no gabinete. O gabinete é composto por um invólucro de aço com uma porta frontal articulada. Várias travas twist-lock mantêm a porta bem fechada, e uma vedação em torno da borda externa da porta fornece um selo weather-tight para proteção dos componentes eléctricos e eletrônicos internos. Conexões são instaladas na parte de baixo das laterais do gabinete para permitir a entrada de cabos de energia e de detecção.

Acionadores de freqüência variável, um Controlador Lógico Programável (CLP), barreiras intrinsecamente de segurança, blocos de terminais, fusíveis, e outros componentes elétricos são instalados no gabinete. Um aparelho de ar condicionado é usado para manter um ambiente local apropriado para o funcionamento dos equipamentos elétricos, e um sistema de drenagem automático mantém uma pressão interna positiva para impedir a entrada de vapores perigosos. O sistema de drenagem liga a energia elétrica dos componentes do gabinete apenas quando a pressão positiva for alcançada dentro do gabinete de controle.

O painel de controle de interface do operador e mouse é instalado em frente ao gabinete em cima da porta. Um botão de parada de emergência à esquerda do painel de controle permite um desligamento instantâneo da energia elétrica em caso de emergência. Orelhas de fixação são soldadas ao gabinete para facilitar o içamento e posicionamento.

Para centrífugas instaladas em ambientes perigosos, um sistema de drenagem é instalado no gabinete de controle para fornecer um fluxo contínuo de ar evitando a acumulação de vapores explosivos no interior do gabinete. Quando a energia é aplicada na centrífuga, o sistema de drenagem do gabinete inicia um ciclo rápido de drenagem de 12 minutos com 16 CFM. Este ciclo é composto de cinco trocas de ar completas. Quando o ciclo rápido de drenagem for concluído, o sistema de drenagem automaticamente fecha um interruptor que fornece energia ao gabinete.

Durante o funcionamento da centrífuga, o sistema de drenagem mantém um fluxo contínuo de ar para fornecer pressão positiva dentro do gabinete de controle para impedir a entrada de gás inflamável. Sensores de pressão mínima e de fluxo de drenagem fornecem um sinal de saída para o PLC se o sistema de drenagem não mantiver uma pressão satisfatória dentro do gabinete. Para mais detalhes do funcionamento do sistema de drenagem, consulte a documentação de exposição de Tecnologias na Seção 12 - Dados do Fornecedor.

Interruptor De Vibração

O interruptor de vibração (Figura 1-3) é um dispositivo de segurança para proteger os funcionários e equipamentos, desligando a centrífuga em caso de vibração excessiva. Normalmente os contatos do interruptor são mantidos fechados por uma trava mecânica. No entanto, vibração forte ou um choque de 2Gs irá sobrecarregar o fecho magnético, fazendo a armadura do interruptor romper com a posição normalmente fechada, fornecendo uma entrada

para o PLC. Um botão de restaurar do lado do interruptor deve ser pressionado manualmente para fechar os contatos e restaurar o fecho magnético. O nível de acionamento da vibração é ajustável por meio de um controle de ponto de ajuste, que ajusta o espaço de ar entre o arm-plate de imã e de trava. Girar o parafuso no sentido anti-horário diminui o ponto definido de vibração em termos de força G necessário para o acionamento da armadura. Quando o controle é girado totalmente no sentido horário, o interruptor acionará no nível de vibração máxima.

O interruptor de vibração fica montado sobre a base da centrífuga em uma orientação que é mais afetada por vibração fora-de-equilíbrio do conjunto do recipiente. Entupimento do transportador ou rolamentos gastos podem produzir vibrações suficientemente elevadas para acionar o interruptor.

Figura 1-3 Interruptor de Vibração

Invólucro, Base e Estrado.

Os invólucros superior e inferior de aço inoxidável semi-asseguram uma vedação, é este gabinete protetor que envolve totalmente o conjunto do recipiente. O tubo de descarga de líquidos e a calha de descarga de sólidos são instalados na parte inferior da metade de baixo. Defletores de contato instalados dentro das metades superior e inferior do gabinete separam os sólidos e líquidos. Parafusos prendem as metades superior e inferior e uma junta de borracha no invólucro superior sela as duas metades. Um gabinete separado por duas peças é fornecido para a caixa de engrenagem na extremidade de líquidos do conjunto do recipiente.

O invólucro é parafusado no conjunto da base de aço soldado, que contém disposições de montagem para os rolamentos pillow block e suporte para tubos de alimentação. O conjunto da base é parafusado ao estrado de aço soldado.

OPERAÇÃO MECÂNICA

A centrífuga recebe lama/pasta na extremidade da roldana (extremidade de descarga de sólidos) da máquina. Para melhor desempenho, a lama/pasta deve ser examinada a 74 micros em máquinas de triagem vibratória antes de passar para a centrífuga para processamento.

A lama/pasta flui através de um tubo de alimentação para dentro do recipiente rotativo, onde a força centrífuga separa líquidos dos sólidos. O líquido flui para fora da conexão de descarga de líquidos na extremidade da caixa de engrenagem da centrífuga, enquanto os sólidos são encaminhados para a descarga de sólidos onde eles caem em uma calha na parte inferior da máquina.

A centrífuga é configurada de fábrica para funcionar com uma tensão AC específica de sistema trifásico, em 50Hz ou 60Hz. Controles elétricos são montados na caixa de controle elétrica localizada na extremidade de descarga de líquidos da máquina. Dispositivos de segurança incorporados à centrífuga protegem funcionários e equipamento através do desligamento do motor de acionamento em caso de pressão excessiva do transportador, alta temperatura do motor, vibração ou outro mau funcionamento.

A força G produzida pela rotação de alta velocidade do recipiente cilíndrico separa os sólidos da lama/pasta inicial. O desempenho da centrífuga é baseado em três fatores variáveis:

- Força G exercida sobre o fluido - Força Gravitacional puxando líquido contra a parede externa da centrífuga
- Tempo de Retenção na centrífuga - Quanto mais tempo a lama/pasta permanecer na centrífuga haverá menos partículas que possam ser separadas
- Velocidade diferencial do transportador - Quanto mais rápido o transportador girar mais úmidos os sólidos ficaram e os mais sólidos serão descartados

Todos os três fatores podem ser manipulados para alterar a descarga de líquidos e sólidos. Ao alterar o diâmetro da polia do motor, o RPM do recipiente é alterado. O Tempo de retenção é controlado pelo ajuste das portas de descarga de líquidos na parte superior do recipiente de líquidos para mudar a profundidade do poço (nível de líquido), e a velocidade diferencial do transportador pode ser alterada mudando a proporção da caixa de engrenagem. O transportador opera a uma velocidade inferior à do recipiente, sua velocidade é derivada da proporção de caixa de engrenagem. A velocidade de transporte é a diferença entre as velocidades do recipiente e do transportador.

O ajuste de qualquer parâmetro—profundidade do poço, e velocidade do recipiente e velocidade diferencial do transportador—requer o desligamento do equipamento. Outro método de alterar os resultados de descarga é mudar a taxa de alimentação.

Durante a operação da centrífuga, a lama/pasta é bombeada através do tubo de alimentação no centro do transportador rotativo (Figura 1-4), onde se espirra contra o acelerador de alimentação. A lama/pasta em alta velocidade é, então, dispersa por quatro bocais de alimentação na periferia do cilindro de transporte. Girando a uma velocidade maior do que a do transportador, o recipiente cria um efeito de corte adicional, que aumenta ainda mais a aceleração da lama/pasta.

À medida que a lama/pasta flui nos canais entre as correias do transportador, as partículas pesadas assentam em um ritmo acelerado devido à força G imposta pelo recipiente rotativo. As partículas de areia assentam quase instantaneamente, em seguida, as partículas mais finas e leves. As partículas que não puderem ser assentadas na configuração atual serão descartadas com o líquido através das barreiras ajustáveis na extremidade do recipiente de líquidos. O líquido saído da parte superior do recipiente de líquidos é dirigido através da saída de descarga de líquidos.

Os sólidos assentados formam um bolo no interior do recipiente e são transportados pelo transportador em direção à extremidade estreita do recipiente, ou a praia. Como os sólidos viajando ao longo da praia, a película de líquido livre é perdida devido à compressão e drenagem da centrífuga. Quando eles são descartados em alta velocidade através das portas de descarga de sólidos no recipiente, eles contêm apenas a umidade adsorvida.

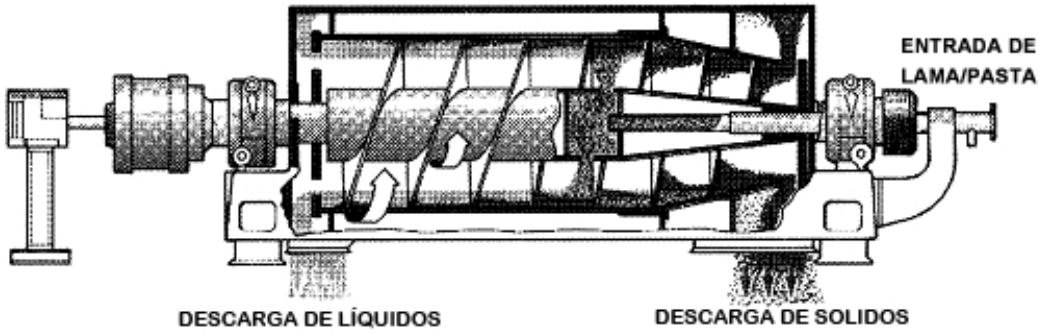

Figura 1-4 Operação da Centrífuga

SISTEMA DE CONTROLE

A operação da centrifugação é supervisionada por um Controlador Lógico Programável (PLC) que interage com os Controladores de Freqüência Variável (VFDs) fornecendo energia para o motor de acionamento do recipiente, transportador e bomba de alimentação. Monitoramento e controle da centrífuga podem ser executados localmente ou até a milhares de quilômetros de distância. O PLC fortemente ambientado também oferece armazenamento de dados de curto prazo e um alto grau de flexibilidade operacional. A interface gráfica montada no gabinete de controle facilita a comunicação com os VFDs e oferece acesso em tempo real às características do sistema operacional. Através do painel de controle, o operador pode inicializar a centrífuga, entrar e ajustar as velocidades do recipiente e transportador, definir taxa de alimentação, e desligar a máquina.

Vários fatores, incluindo temperaturas do rolamento principal, velocidade do recipiente, torques do transportador e recipiente, temperatura do interior do gabinete, e vibração, são transmitidos ao PLC, que então responde com saídas correspondentes para reger o funcionamento da centrífuga. Informações sobre o estado crítico é exibida no painel de controle, bem como alarmes e mensagens de falha, que sinalizam para o operador qualquer mau funcionamento em potencial ou iminente. Qualquer variação excessiva do limite pré-definido faz com que o PLC desligue automaticamente a centrífuga e exiba uma mensagem explicativa sobre a causa do desligamento. Além disso, o desligamento de emergência pode ser realizado pelo operador, a qualquer momento pelo painel frontal.

A bomba de alimentação é totalmente controlada pelo PLC tanto no funcionamento manual quanto na automática. O funcionamento automático proporciona produtividade máxima, visto que a taxa de alimentação ideal é assegurada pelo PLC sob condições operacionais variadas. A alimentação é aumentada automaticamente até o limite pré-definido do torque ser atingido tanto pelo motor de acionamento do recipiente quanto do transportador. Se propriedades da lama/poupa de alimentação mudar, a taxa de alimentação é ajustada automaticamente para manter-se dentro do limite do torque.

INFORMAÇÕES DE CONTATO

INFORMAÇÕES DE CONTATO			
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SUPORTE TÉCNICO

A Corporação Derrick oferece suporte técnico 24-horas por dia, 7 dias por semana. O suporte técnico inclui a substituição de tela/informação do pedido e reparação/reposição de peças e serviços para toda a linha de produtos. Consulte a tabela a seguir para achar o centro de peças/serviço mais próximo de você.

LOCALIZAÇÕES DE VENDAS DE PEÇAS & SERVIÇOS
Colorado - 970.241.2417
Louisiana
Broussard - 877.635.3354
Mississippi
Laurie - 877.635.3354
Nova York - Sede Corporativa
Buffalo - 716.683.9010
Oklahoma
Oklahoma City - 405.208.4070
Texas
Houston (sede Oilfield) - 866.DERRICK (337,7425)
Bridgeport - 940.210.9975
Corpus Christi - 361.664.2410
Longview - 337.298.9411
Midland - 432.230.3720
Wyoming - 307.265.0445
Alemanha - 011.49.5162.98580

SEÇÃO 2 - SEGURANÇA

GERAL

Esta seção contém um resumo dos AVISOS utilizados neste manual e uma lista de Fichas com Dados de Segurança do Material (MSDSs) aplicável ao equipamento. A centrífuga foi projetada para desempenhar as funções estabelecidas com segurança.

AVISOS

Todos os funcionários responsáveis pela operação e manutenção deste equipamento devem ler e entender todas as informações de segurança contidas neste manual antes de operar e/ou fazer manutenção do equipamento. Os avisos de segurança enumerados a seguir são incluídos nos procedimentos aplicáveis ao longo deste manual.

Som

ATENÇÃO! PARA PROTEÇÃO CONTRA PERDA DE AUDIÇÃO, PROTETORES DE OUVINDO DEVEM SER USADOS SEMPRE E POR QUALQUER FUNCIONÁRIO QUE ESTEJA PERTO OU TRABALHANDO EM UMA MÁQUINA DERRICK.

Riscos Eléctricos

ATENÇÃO! PARA EVITAR SÉRIAS LESÕES FISICAS CERTIFIQUI-SE DE QUE O EQUIPAMENTO ESTÁ BLOQUEADO E ETIQUETADO (LOTO), DESENERGISADO, E TENHA PARADO DE GIRAR ANTES DE EXECUTAR AJUSTES E/OU MANUTENÇÃO.

ATENÇÃO! O MOTOR DE ACIONAMENTO DEVE SER OPERADO NA VOLTAGEM DE FORNECIMENTO DESIGNADA.

ATENÇÃO! ALTA TENSÃO PODE ESTAR PRESENTE. TENHA CERTEZA QUE O FUSÍVEL QUE DISCONECTA O FORNECIMENTO DE ENERGIA ELETRICA DESTE EQUIPAMENTO ESTÁ ABERTO. BLOQUEI E ETIQUETE (LOTO) O SUPRIMENTO DE ENERGIA PARA PREVENIR APLICAÇÃO ACIDENTAL DE ENERGIA ENQUANTO AJUSTES E/OU MANUTENÇÃO ESTÃO EM PROGRESSO.

ATENÇÃO! CONEXÕES ELÉTRICAS DEVEM SER FEITAS DE ACORDO COM O CÓDIGO ELÉTRICO NACIONAL APLICÁVEL AO LOCAL. FALHA NO CUMPRIMENTO PODE RESULTAR NUMA CONDIÇÃO PERIGOSA QUE PODERIA MACHUCAR ALGUEM OU DANIFICA O EQUIPAMENTO. ASSEGURAR-SE QUE TODAS AS CONEXÕES ELÉTRICAS E DE CONDUITES ESTÃO SEGURAS.

Manipulação do Equipamento

	ATENÇÃO! USE BARRAS ESPAÇADORAS PARA PREVENIR DANOS AO LEVANTAR O EQUIPAMENTO.
	ATENÇÃO! PARA ASSEGURAR O EQUILÍBRIO E ORIENTAÇÃO ADEQUADOS QUANDO A UNIDADE FOR LEVANTADA E PREVENIR DANOS AOS COMPONENTES, SÓ FIXAR AS CORRENTES DE LEVANTAMENTO NOS PONTOS DE ELEVAÇÃO DESIGNADOS. NÃO TENTAR A SUSPENÇÃO POR FIXAÇÃO NO MOTOR OU EM NENHUM OUTRO LOCAL.
	ATENÇÃO! ASSEGURE-SE QUE O DISPOSITIVO DE SUPORTE TENHA CAPACIDADE DE LEVANTAMENTO SUFICIENTE PARA COM SEGURANÇA AGUENTAR O PESO DO EQUIPAMENTO.
	ATENÇÃO! NÃO RETIRAR OS SUPORTES DE TRANPORTE ATÉ QUE O EQUIPAMENTO ESTEJA POSICIONADO NO LOCAL FINAL DA INSTALAÇÃO.

Operação

	ATENÇÃO! TODO PESSOAL DE OPERAÇÃO E DE MANUTENÇÃO DEVE LER E ENTENDER TODAS AS INFORMAÇÕES DE SEGURANÇA DESTE MANUAL ANTES DE TRABALHAR COM O EQUIPAMENTO.
	ATENÇÃO! ASSEGURE-SE QUE TODAS AS TAMPAS SUPERIORES ESTÃO FECHADAS E SEGURAS E TODOS OS FUNCIONÁRIOS FORAM REMOVIDO ANTES DA MÁQUINA COMEÇAR A FUNCIONAR.
	ATENÇÃO! ANTES DA CENTRÍFUGA COMEÇAR A FUNCIONAR ASSEGURE-SE QUE TODOS OS SUPORTES DE TRANSPORTE FORAM RETIRADOS E OS ROLAMENTOS PILLOW BLOCKS ESTÃO DEVIDAMENTE APERTADOS.
	ATENÇÃO! SEMPRE PERMITA QUE A MÁQUINA DESACELERE ATÉ UMA PARADA COMPLETA ANTES DE ABRIR A TAMPA SUPERIOR OU REMOVER OS PROTETORES.
	ATENÇÃO! NÃO OPERAR A CENTRÍFUGA SE ELA DESENVOLVER BARULHO OU VIBRAÇÃO EXCESSIVA. SEMPRE CONFIRME QUE O INTERRUPTOR DE VIBRAÇÃO E OUTROS DISPOSITIVOS DE SEGURANÇA ESTÃO FUNCIONANDO.

Manutenção

	ATENÇÃO! ALTA TENSÃO PODE ESTAR PRESENTE. SEMPRE ABRA O FUSÍVEL QUE DESCONECTA O FORNECIMENTO DE ELETRICIDADE AO EQUIPAMENTO, E BLOQUEI E ETIQUETE (LOTO) O SUPRIMENTO DE ENERGIA ANTES DE EXECUTAR QUALQUER AJUSTE DE E/OU DE MANUTENÇÃO NO EQUIPAMENTO.

Armazenamento

ATENÇÃO! A CENTRÍFUGA PODE SER DANIFICADA POR SER ARMAZENANDA EM AMBIENTE DE ALTA UMIDADE (MAIOR QUE 50% HR). O EQUIPAMENTO DEVE SER ARMAZENADO NUM AMBIENTE DE BAIXA-UMIDADE.

FICHAS COM DADOS DE SEGURANÇA DO MATERIAL (MSDSs)

As Fichas com Dados de Segurança do Material (MSDSs) para produtos de acabamento externo são incluídas nas páginas seguintes para aconselhar o pessoal sobre as propriedades e possíveis perigos destes materiais. Estes documentos foram elaborados pelos fabricantes dos produtos, que tem exclusiva responsabilidade pela exatidão das informações.

Os MSDSs inclusos estão atualizados com a data de publicação do presente manual e são fornecidos somente como referência. É de responsabilidade do cliente entrar em contato com o fabricante do produto para obtenção dos documentos mais recentes.

Além da documentação do produto final, MSDSs estão listados para outros produtos utilizados no equipamento. Para garantir que a informação atual encontra-se disponível, o MSDS de cada produto deve ser obtido no momento da compra. Note que os produtos equivalentes, para os materiais listados são aprovados por Derrick para as aplicações correspondentes.

APLICAÇÃO - DESCRIÇÃO	Nº do MSDS / Data
Tintas	
Devoe Devthane 359 - Top Coat	*359* / 05-06-08
Devoe Epoxy Primer - Undercoat	*313K* / 08-02-04
Lubrificantes	
Ambiente Ártico	
Todos os Rolamentos - Shell Aeroshell GR-14	*56200E-9* / 10-23-03*
Caixa de Engrenagem- SHC Mobil 220	Entre em contato com o fabricante*
Ambiente Normal	
Todos os Rolamentos - Chevron SRI NLGI 2	*6979* / 08-03-04*
Caixa de Engrenagem - Shell Omala 320	*
Grau Alimentício	
Só os Rolamentos Principais - Chevron SRI NLGI 2	*6979* / 08-03-04*
Só os Rolamentos de Transporte - Mobil FM 102	*642363-00* / 01-17-02*
Vedação	
Lubrificantes Antigripante da Loctite - Fechos	*76764* / 09-27-04*

* MSDS não incluída; contate o fabricante para a última revisão.

MATERIAL SAFETY DATA SHEET

prepared 05/06/08

HAZARDS IDENTIFICATION (ANSI Section 3)

Primary route(s) of exposure : Inhalation, skin contact, eye contact, ingestion.

Effects of overexposure :

Inhalation : Irritation of respiratory tract. Prolonged inhalation may lead to. Inhalation of spray mist may cause irritation of respiratory tract. Mucous membrane irritation, fatigue, drowsiness, dizziness and/or lightheadedness, headache, uncoordination, nausea, vomiting, abdominal pain, chest pain, coughing, apathy, central nervous system depression, intoxication, anesthetic effect or narcosis, difficulty of breathing, allergic response, tremors, severe lung irritation or damage, pulmonary edema, pneumoconiosis, loss of consciousness, respiratory failure, death. Possible sensitization to respiratory tract.

Skin contact : Irritation of skin. Prolonged or repeated contact can cause dermatitis, defatting, severe skin irritation. Possible sensitization to skin.

Eye contact : Irritation of eyes. Prolonged or repeated contact can cause conjunctivitis, blurred vision, tearing of eyes, redness of eyes, severe eye irritation, corneal injury.

Ingestion : Ingestion may cause lung inflammation and damage due to aspiration of material into lungs, mouth and throat irritation, drowsiness, dizziness and/or lightheadedness, headache, uncoordination, nausea, vomiting, diarrhea, gastro-intestinal disturbances, abdominal pain, visual disturbances, apathy, central nervous system depression, intoxication, anesthetic effect or narcosis, burns of the mouth, throat, stomach, pulmonary edema, loss of consciousness, respiratory failure, death.

Medical conditions aggravated by exposure : Eye, skin, respiratory disorders, kidney disorders, liver disorders, nervous system disorders, respiratory disorders.

FIRST-AID MEASURES (ANSI Section 4)

Inhalation : Remove to fresh air. Restore and support continued breathing. Get emergency medical attention. Have trained person give oxygen if necessary. Get medical help for any breathing difficulty. Remove to fresh air if inhalation causes eye watering, headaches, dizziness, or other discomfort.

Skin contact : Wash thoroughly with soap and water. If any product remains, gently rub petroleum jelly, vegetable or mineral/baby oil onto skin. Repeated applications may be needed. Remove contaminated clothing. Wash contaminated clothing before re-use. Dispose of contaminated leather items, such as shoes and belts. If irritation occurs, consult a physician.

Eye contact : Flush immediately with large amounts of water, especially under lids for at least 15 minutes. If irritation or other effects persist, obtain medical treatment.

Ingestion : If swallowed, obtain medical treatment immediately.

FIRE-FIGHTING MEASURES (ANSI Section 5)

Fire extinguishing media : Dry chemical or foam water fog. Carbon dioxide. Closed containers may explode when exposed to extreme heat or fire. Vapors may ignite explosively at ambient temperatures. Vapors are heavier than air and may travel long distances to a source of ignition and flash back. Vapors can form explosive mixtures in air at elevated temperatures. Closed containers may burst if exposed to extreme heat or fire. Dust explosion hazard. May decompose under fire conditions emitting irritant and/or toxic gases.

Fire fighting procedures : Water may be used to cool and protect exposed containers. Firefighters should use full protective clothing, eye protection, and self-contained breathing apparatus. Self-contained breathing apparatus recommended.

Hazardous decomposition or combustion products : Carbon monoxide, carbon dioxide, oxides of nitrogen, oxides of sulfur, ammonia, hydrogen chloride, toxic gases, barium compounds. Cyanides.

ACCIDENTAL RELEASE MEASURES (ANSI Section 6)

Steps to be taken in case material is released or spilled : Comply with all applicable health and environmental regulations. Eliminate all sources of ignition. Ventilate area. Ventilate area with explosion-proof equipment. Spills may be collected with absorbent materials. Use non-sparking tools. Evacuate all unnecessary personnel. Place collected material in proper container. Complete personal protective equipment must be used during cleanup. Large spills - shut off leak if safe to do so. Dike and contain spill. Pump to storage or salvage vessels. Use absorbent to pick up excess residue. Keep salvageable material and rinse water out of sewers and water courses. Small spills - use absorbent to pick up residue and dispose of properly.

HANDLING AND STORAGE (ANSI Section 7)

Handling and storage : Store below 80f. Store below 100f (38c). Keep away from heat, sparks and open flame. Store in original container. Keep away from direct sunlight, heat and all sources of ignition. Keep container tightly closed in a well-ventilated area.

Other precautions : Use only with adequate ventilation. Do not take internally. Keep out of reach of children. Avoid contact with skin and eyes, and breathing of vapors. Wash hands thoroughly after handling, especially before eating or smoking. Keep containers tightly closed and upright when not in use. Empty containers may contain hazardous residues. Ground equipment when transferring to prevent accumulation of static charge.

EXPOSURE CONTROLS/PERSONAL PROTECTION (ANSI Section 8)

Respiratory protection : Respiratory protection is required for use in isocyanate containing environments. Consider type of application and environmental concentrations when selecting respiratory protection. Observe governmental regulations for respirator use. (29 CFR 1910.134(OSHA))(Canadian z94.4) The use of positive pressure supplied air respirator is mandatory when the airborne isocyanate concentrations are not known. Note: isocyanate based materials have been determined to cause allergic sensitization in humans. Avoid inhalation and dermal (skin) contact with the uncured material.

Ventilation : Provide dilution ventilation or local exhaust to prevent build-up of vapors. Use explosion-proof equipment. Use non-sparking equipment.

Personal protective equipment : Eye wash, safety shower, safety glasses or goggles. Impervious gloves, impervious clothing, face shield, apron, boots.

STABILITY AND REACTIVITY (ANSI Section 10)

Under normal conditions : Stable see section 5 fire fighting measures

Materials to avoid : Oxidizers, acids, reducing agents, bases, aldehydes, halogens, amines, alkalis, water, peroxides, nitric acid, alcohols, combustible materials, caustics, mineral acids. Nitrates.

Conditions to avoid : Sunlight, elevated temperatures, moisture, contact with oxidizing agent, storage near acids, sparks, open flame, ignition sources.

Hazardous polymerization : Will not occur

The information contained herein is based on data available at the time of preparation of this data sheet which ICI Paints believes to be reliable. However, no warranty is expressed or implied regarding the accuracy of this data. ICI Paints shall not be responsible for the use of this information, or of any product, method or apparatus mentioned and you must make your own determination of its suitability and completeness for your own use, for the protection of the environment, and the health and safety of your employees and the users of this material.
Complies with OSHA hazard communication standard 29CFR1910.1200.

TOXICOLOGICAL INFORMATION (ANSI Section 11)

Supplemental health information : Contains a chemical that is moderately toxic by ingestion. Contains a chemical that is toxic by inhalation. Contains a chemical that may be absorbed through skin. Free diisocyanate may cause allergic reaction in susceptible persons. Notice - reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal. Contains iron oxide, repeated or prolonged exposure to iron oxide dust may cause siderosis, a benign pneumoconiosis. Other effects of overexposure may include toxicity to liver, kidney, central nervous system, blood.

Carcinogenicity : Contains formaldehyde, a potential cancer hazard. Rats exposed to formaldehyde via inhalation developed cancer of the nasal cavity. Evidence in humans is limited (nasal and nasopharyngeal cancer). Formaldehyde is listed as a carcinogen by OSHA, probable human carcinogen (group 2a) by IARC, and anticipated human carcinogen by NTP. Overexposure can cause eye, skin, and respiratory tract irritation, and skin and respiratory sensitization. In a lifetime inhalation study, exposure to 250 mg/m3 titanium dioxide resulted in the development of lung tumors in rats. These tumors occurred only at dust levels that overwhelmed the animals' lung clearance mechanisms and were different from common human lung tumors in both type and location. The relevance of these findings to humans is unknown but questionable. The international agency for research on cancer (IARC) has classified titanium dioxide as possibly carcinogenic to humans (group 2b) based on inadequate evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals.

Reproductive effects : High exposures to xylene in some animal studies, often at maternally toxic levels, have affected embryo/fetal development. The significance of this finding to humans is not known.

Mutagenicity : No mutagenic effects are anticipated

Teratogenicity : No teratogenic effects are anticipated

ECOLOGICAL INFORMATION (ANSI Section 12)

No ecological testing has been done by ICI paints on this product as a whole.

DISPOSAL CONSIDERATIONS (ANSI Section 13)

Waste disposal : Dispose in accordance with all applicable regulations. Avoid discharge to natural waters.

REGULATORY INFORMATION (ANSI Section 15)

As of the date of this MSDS, all of the components in this product are listed (or are otherwise exempt from listing) on the TSCA inventory. This product has been classified in accordance with the hazard criteria of the CPR (controlled products regulations) and the MSDS contains all the information required by the CPR.

Physical Data (ANSI Sections 1, 9, and 14)

Product Code	Description	Wt. / Gal.	VOC gr. / ltr.	% Volatile by Volume	Flash Point	Boiling Range	HMIS	DOT, proper shipping name
359F65DGF	devthane 359h (no organic haps) derrick green	9.02	291.43	34.96	80 f	208-595	*330	UN1263, paint, 3, PGIII
379C0910	devthane 379 hs converter	9.40	112.85	13.00	135 f	293-293	*321	UN1866, resin solution, combustible liquid, PGIII

Ingredients Product Codes with % by Weight (ANSI Section 2)

Chemical Name	Common Name	CAS. No.	359F65DGF	379C0910
4-heptanone, 2,6-dimethyl-	diisobutyl ketone	108-83-8	1-5	
ethane, 1,1',1''-methylidenetris(oxy)-tris-	ethyl orthoformate	122-51-0	1-5	
acetic acid, butyl ester	butyl acetate	123-86-4	5-10	5-10
c.i. pigment green 7	phthalo green pigment	1328-53-6	1-5	
benzene, dimethyl-	xylene	1330-20-7	.1-1.0	.1-1.0
titanium oxide	titanium dioxide	13463-67-7	1-5	
2-propenoic acid, 2-methyl-, 2-hydroxyethyl ester, polymer with ethenylbenzene, 2-ethylhexyl 2-propeno and methyl 2-methyl-2-propenoate	acrylic polymer	26916-05-2	40-50	
hexane, 1,6-diisocyanato-, homopolymer	aliphatic polyisocyanate	28182-81-2		90-95
formaldehyde	formaldehyde	50-00-0	LT .01	
c.i. pigment yellow 42	yellow iron oxide	51274-00-1	1-5	
acetic acid, 1,1-dimethylethyl ester	tert-butyl acetate	540-88-5	1-5	
butanamide, 2-((2-methoxy-4-nitrophenyl)azo) -n-(2-methoxyphenyl)-3-oxo-	pigment yellow 74	6358-31-2	1-5	
solvent naphtha (petroleum), light aromatic	light aromatic solvent naphtha	64742-95-6		1-5
1-butanol	n-butanol	71-36-3	1-5	
propanoic acid, 3-ethoxy-, ethyl ester	ethyl 3-ethoxypropionate	763-69-9	5-10	
sulfuric acid, barium salt	barium sulfate	7727-43-7	1-5	
castor oil	castor oil, raw	8001-79-4	10-20	
hexane, 1,6-diisocyanato-	hexamethylene diisocyanate	822-06-0		.1-1.0
acetic acid, c6-8-branched alkyl esters	oxo-heptyl acetate	90438-79-2	1-5	
benzene,1,2,4-trimethyl-	pseudocumene	95-63-6	.1-1.0	1-5
anti-settling agent	anti-settling agent	Sup. Conf.	1-5	
polyamide	rheological additive	Sup. Conf.	1-5	

Chemical Hazard Data (ANSI Sections 2, 8, 11, and 15)

		ACGIH-TLV				OSHA-PEL				S.R. Std.	S2	S3	CC					
Common Name	CAS. No.	8-Hour TWA	STEL	C	S	8-Hour TWA	STEL	C	S					H	M	N	I	O
diisobutyl ketone	108-83-8	25 ppm	not est.	not est.	not est.	50 ppm	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
ethyl orthoformate	122-51-0	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
butyl acetate	123-86-4	150 ppm	200 ppm	not est.	not est.	150 ppm	not est.	not est.	not est.	not est.	n	n	y	n	n	n	n	n
phthalo green pigment	1328-53-6	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
xylene	1330-20-7	100 ppm	150 ppm	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	y	y	y	n	n	n	n
titanium dioxide	13463-67-7	10 mg/m3	not est.	not est.	not est.	10 mg/m3	not est.	not est.	not est.	not est.	n	n	n	n	n	y	y	n
acrylic polymer	26916-05-2	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
aliphatic polyisocyanate	28182-81-2	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
formaldehyde	50-00-0	not est.	not est.	0.3 ppm	not est.	0.75 ppm	2 ppm	not est.	not est.	not est.	y	y	y	y	n	y	y	y
yellow iron oxide	51274-00-1	5 mg/m3	not est.	not est.	not est.	10 mg/m3	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
tert-butyl acetate	540-88-5	200 ppm	not est.	not est.	not est.	200 ppm	not est.	not est.	not est.	not est.	n	n	y	n	n	n	n	n
pigment yellow 74	6358-31-2	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
light aromatic solvent naphtha	64742-95-6	not est.	not est.	not est.	not est.	500x ppm	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
n-butanol	71-36-3	20 ppm	not est.	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	y	y	n	n	n	n	n
ethyl 3-ethoxypropionate	763-69-9	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
barium sulfate	7727-43-7	10 mg/m3	not est.	not est.	not est.	5 mg/m3	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
castor oil, raw	8001-79-4	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
hexamethylene diisocyanate	822-06-0	0.005 ppm	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	y	y	y	n	n	n	n
oxo-heptyl acetate	90438-79-2	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
pseudocumene	95-63-6	25 ppm	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	y	n	n	n	n	n	n
anti-settling agent	Sup. Conf.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
rheological additive	Sup. Conf.	10 mg/m3	not est.	not est.	not est.	5 mg/m3	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n

Footnotes:

C=Ceiling - Concentration that should not be exceeded, even instantaneously.

S=Skin - Additional exposure, over and above airborn exposure, may result from skin absorption.

n/a=not applicable
not est=not established
CC=CERCLA Chemical

ppm=parts per million
mg/m3=milligrams per cubic meter
Sup Conf=Supplier Confidential

S2=Sara Section 302 EHS
S3=Sara Section 313 Chemical
S.R.Std.=Supplier Recommended Standard

H=Hazardous Air Pollutant, M=Marine Pollutant
P=Pollutant, S=Severe Pollutant
Carcinogenicity Listed By:
N=NTP, I=IARC, O=OSHA, y=yes, n=no

MATERIAL SAFETY DATA SHEET

prepared 08/02/04

HAZARDS IDENTIFICATION (ANSI Section 3)

Primary route(s) of exposure : Inhalation, skin contact, eye contact, ingestion.

Effects of overexposure :

Inhalation : Irritation of respiratory tract. Prolonged inhalation may lead to mucous membrane irritation, fatigue, drowsiness, dizziness and/or lightheadedness, headache, uncoordination, nausea, vomiting, diarrhea, abdominal pain, chest pain, blurred vision, flu-like symptoms, coughing, sneezing, difficulty with speech, apathy, central nervous system depression, anesthetic effect or narcosis, difficulty of breathing, allergic response, fever and chills, tremors, abnormal blood pressure, severe lung irritation or damage, liver damage, kidney damage, pulmonary edema, pneumoconiosis, loss of consciousness, respiratory failure, asphyxiation, death. Possible sensitization to respiratory tract.

Skin contact : Irritation of skin. Prolonged or repeated contact can cause dermatitis, defatting, blistering, allergic response, severe skin irritation, severe skin irritation or burns. Possible sensitization to skin.

Eye contact : Irritation of eyes. Prolonged or repeated contact can cause conjunctivitis, blurred vision, tearing of eyes, redness of eyes, severe eye irritation, severe eye irritation or burns, corneal injury.

Ingestion : Ingestion may cause lung inflammation and damage due to aspiration of material into lungs, mouth and throat irritation, drowsiness, dizziness and/or lightheadedness, headache, uncoordination, nausea, vomiting, diarrhea, gastro-intestinal disturbances, abdominal pain, visual disturbances, apathy, central nervous system depression, anesthetic effect or narcosis, burns of the mouth, throat, stomach, liver damage, kidney damage, pulmonary edema, loss of consciousness, respiratory failure, death.

Medical conditions aggravated by exposure : Eye, skin, respiratory disorders, lung disorders, asthma-like conditions, respiratory disorders.

FIRST-AID MEASURES (ANSI Section 4)

Inhalation : Remove to fresh air. Restore and support continued breathing. Get emergency medical attention. Have trained person give oxygen if necessary. Get medical help for any breathing difficulty.

Skin contact : Wash thoroughly with soap and water. If any product remains, gently rub petroleum jelly, vegetable or mineral/baby oil onto skin. Repeated applications may be needed. Remove contaminated clothing. Wash contaminated clothing before re-use. Dispose of contaminated leather items, such as shoes and belts. If irritation occurs, consult a physician.

Eye contact : Flush immediately with large amounts of water, especially under lids for at least 15 minutes. If irritation or other effects persist, obtain medical treatment.

Ingestion : If swallowed, obtain medical treatment immediately.

FIRE-FIGHTING MEASURES (ANSI Section 5)

Fire extinguishing media : Dry chemical or foam water fog. Carbon dioxide. Closed containers may explode when exposed to extreme heat or fire. Vapors may ignite explosively at ambient temperatures. Vapors are heavier than air and may travel long distances to a source of ignition and flash back. Vapors can form explosive mixtures in air at elevated temperatures. Closed containers may burst if exposed to extreme heat or fire. May decompose under fire conditions emitting irritant and/or toxic gases.

Fire fighting procedures : Water may be used to cool and protect exposed containers. Firefighters should use full protective clothing, eye protection, and self-contained breathing apparatus. Self-contained breathing apparatus recommended.

Hazardous decomposition or combustion products : Carbon monoxide, carbon dioxide, oxides of nitrogen, oxides of sulfur, ammonia, aldehydes, toxic gases, barium compounds. Cyanides.

ACCIDENTAL RELEASE MEASURES (ANSI Section 6)

Steps to be taken in case material is released or spilled : Comply with all applicable health and environmental regulations. Eliminate all sources of ignition. Ventilate area. Ventilate area with explosion-proof equipment. Spills may be collected with absorbent materials. Use non-sparking tools. Evacuate all unnecessary personnel. Place collected material in proper container. Complete personal protective equipment must be used during cleanup. Large spills - shut off leak if safe to do so. Dike and contain spill. Pump to storage or salvage vessels. Use absorbent to pick up excess residue. Keep salvageable material and rinse water out of sewers and water courses. Small spills - use absorbent to pick up residue and dispose of properly.

HANDLING AND STORAGE (ANSI Section 7)

Handling and storage : Store below 80f. Store below 100f (38c). Keep away from heat, sparks and open flame. Keep away from direct sunlight, heat and all sources of ignition.

Other precautions : Use only with adequate ventilation. Do not take internally. Keep out of reach of children. Avoid contact with skin and eyes, and breathing of vapors. Wash hands thoroughly after handling, especially before eating or smoking. Keep containers tightly closed and upright when not in use. Empty containers may contain hazardous residues. Ground equipment when transferring to prevent accumulation of static charge.

EXPOSURE CONTROLS/PERSONAL PROTECTION (ANSI Section 8)

Respiratory protection : Control environmental concentrations below applicable exposure standards when using this material. When respiratory protection is determined to be necessary, use a NIOSH/MSHA (Canadian z94.4) Approved elastomeric sealing- surface facepiece respirator outfitted with organic vapor cartridges and paint spray (dust/mist) prefilters. Determine the proper level of protection by conducting appropriate air monitoring. Consult 29CFR1910.134 For selection of respirators (Canadian z94.4).

Ventilation : Provide dilution ventilation or local exhaust to prevent build-up of vapors. Use explosion-proof equipment. Use non-sparking equipment.

Personal protective equipment : Eye wash, safety shower, safety glasses or goggles. Impervious gloves, impervious clothing, face shield, apron.

STABILITY AND REACTIVITY (ANSI Section 10)

Under normal conditions : Stable see section 5 fire fighting measures

Materials to avoid : Oxidizers, acids, reducing agents, bases, aldehydes, ketones, halogens, amines, carbon tetrachloride (at elevated temperatures), aluminum, nitric acid, metal compounds, lewis acids, mineral acids.

Conditions to avoid : Elevated temperatures, moisture, contact with oxidizing agent, storage near acids, sparks, open flame, ignition sources.

Hazardous polymerization : Will not occur may polymerize in presence of aliphatic amines.

TOXICOLOGICAL INFORMATION (ANSI Section 11)

Supplemental health information : Contains a chemical that is moderately toxic by ingestion. Contains a chemical that may be absorbed through skin. Excessive inhalation of fumes may lead to metal fume fever characterized by a metallic taste in mouth, excessive thirst, coughing, weakness, fatigue, muscular pain, nausea, chills and fever. Notice - reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal. Other effects of overexposure may include toxicity to liver, kidney, central nervous system, blood.

The information contained herein is based on data available at the time of preparation of this data sheet which ICI Paints believes to be reliable. However, no warranty is expressed or implied regarding the accuracy of this data. ICI Paints shall not be responsible for the use of this information, or of any product, method or apparatus mentioned and you must make your own determination of its suitability and completeness for your own use, for the protection of the environment, and the health and safety of your employees and the users of this material.
Complies with OSHA hazard communication standard 29CFR1910.1200.

ICI Paints North America
925 Euclid Avenue Cleveland, Ohio 44115
EMERGENCY TELEPHONE NO. (800) 545-2643

Carcinogenicity : The international agency for research on cancer (IARC) has evaluated ethylbenzene and classified it as a possible human carcinogen (group 2b) based on sufficient evidence for carcinogenicity in experimental animals, but inadequate evidence for cancer in exposed humans. In a 2 year inhalation study conducted by the national toxicology program (NTP), ethylbenzene vapor at 750 ppm produced kidney and testicular tumors in rats and lung and liver tumors in mice. Genetic toxicity studies showed no genotoxic effects. The relevance of these results to humans is not known.

Reproductive effects : High exposures to xylene in some animal studies, often at maternally toxic levels, have affected embryo/fetal development. The significance of this finding to humans is not known.

Mutagenicity : Triethylenetetramine has demonstrated weak mutagenic activity in standard in vitro tests, and has caused embryo- fetal toxicity and fetal malformations when fed to rats. Triethylenetetramine did not exhibit carcinogenic potential in life-time mouse skin painting studies.

Teratogenicity : No teratogenic effects are anticipated

ECOLOGICAL INFORMATION (ANSI Section 12)

No ecological testing has been done by ICI paints on this product as a whole.

DISPOSAL CONSIDERATIONS (ANSI Section 13)

Waste disposal : Dispose in accordance with all applicable regulations. Avoid discharge to natural waters.

REGULATORY INFORMATION (ANSI Section 15)

As of the date of this MSDS, all of the components in this product are listed (or are otherwise exempt from listing) on the TSCA inventory. This product has been classified in accordance with the hazard criteria of the CPR (controlled products regulations) and the MSDS contains all the information required by the CPR.

Physical Data (ANSI Sections 1, 9, and 14)

Product Code	Description	Wt. / Gal.	VOC gr. / ltr.	% Volatile by Volume	Flash Point	Boiling Range	HMIS	DOT, proper shipping name
313B0250	do not use, use dc313b0250d instead	24.77	334.95	41.44	90 f	244-304	*231	paint, 3, UN1263, PGIII
313C0910	catha coat 313 organic zinc-rich epoxy primer clear converter	7.54	338.66	41.11	110 f	243-304	*320	paint, combustible liquid, UN 1263, PGIII

Ingredients Product Codes with % by Weight (ANSI Section 2)

Chemical Name	Common Name	CAS. No.	313B0250	313C0910
benzene, ethyl-	ethylbenzene	100-41-4	.1-1.0	
2-heptanone	methyl amyl ketone	110-43-0	5-10	20-30
1,2,-ethanediamine, n,n'-bis(2-aminoethyl)-	triethylenetetramine	112-24-3		1-5
zinc oxide	zinc oxide	1314-13-2	1-5	
benzene, dimethyl-	xylene	1330-20-7	1-5	
oxirane,2,2'-(((1-methylethylidene) bis (4,1-phenyleneoxymethylene))) bis-	diglycidyl ether of bisphenol a	1675-54-3	1-5	
phenol, 4,4'-(1-methylethylidene)bis-, polymer with 2,2'-((1-methylethylidene)bis (4,1-phenyleneoxymethylene))bis(oxirane)	epoxy resin	25036-25-3	1-5	
fatty acids, c18-unsatd., dimers, reaction products with polyethylenepolyamines	polyamide resin	68410-23-1		40-50
1-butanol	n-butanol	71-36-3		10-20
zinc	zinc	7440-66-6	70-80	
sulfuric acid, barium salt	barium sulfate	7727-43-7	1-5	
amine adduct	amine adduct	Sup. Conf.		10-20

Chemical Hazard Data (ANSI Sections 2, 8, 11, and 15)

		ACGIH-TLV				OSHA-PEL				S.R.	S2	S3	CC					
Common Name	CAS. No.	8-Hour TWA	STEL	C	S	8-Hour TWA	STEL	C	S	Std.				H	M	N	I	O
ethylbenzene	100-41-4	100 ppm	125 ppm	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	y	y	y	n	n	y	n
methyl amyl ketone	110-43-0	50 ppm	not est.	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
triethylenetetramine	112-24-3	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
zinc oxide	1314-13-2	2 mg/m3	10 mg/m3	not est.	not est.	5 mg/m3	not est.	not est.	not est.	not est.	n	y	n	n	n	n	n	n
xylene	1330-20-7	100 ppm	150 ppm	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	y	y	y	n	n	n	n
diglycidyl ether of bisphenol a	1675-54-3	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
epoxy resin	25036-25-3	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
polyamide resin	68410-23-1	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
n-butanol	71-36-3	20 ppm	not est.	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	y	y	n	n	n	n	n
zinc	7440-66-6	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	y	y	n	n	n	n	n
barium sulfate	7727-43-7	10 mg/m3	not est.	not est.	not est.	5 mg/m3	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
amine adduct	Sup. Conf.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n

Footnotes:

C=Ceiling - Concentration that should not be exceeded, even instantaneously.

S=Skin - Additional exposure, over and above airborn exposure, may result from skin absorption.

n/a=not applicable
not est=not established
CC=CERCLA Chemical

ppm=parts per million
mg/m3=milligrams per cubic meter
Sup Conf=Supplier Confidential

S2=Sara Section 302 EHS
S3=Sara Section 313 Chemical
S.R.Std.=Supplier Recommended Standard

H=Hazardous Air Pollutant, M=Marine Pollutant
P=Pollutant, S=Severe Pollutant
Carcinogenicity Listed By:
N=NTP, I=IARC, O=OSHA, y=yes, n=no

SEÇÃO 3 - INSTALAÇÃO

GERAL

Esta seção descreve o procedimento de instalação recomendado para o equipamento Derrick definido pelo número do modelo e o número do desenho associado ao seu equipamento. A centrífuga é enviada completamente montado. Portanto, para segurança durante o transporte, o conjunto rotativo é sustentado pelos suportes de transporte. Este deve ser abaixado até a base e, em seguida os seus rolamentos pillow blocks presos à base.

SEGURANÇA

Ler e compreender **TODAS** as informações de segurança apresentadas neste manual **antes** de instalar e operar este equipamento. Consulte a Seção 2 para um resumo dos Avisos direcionados à instalação, operação e manutenção deste equipamento.

Antes de iniciar a instalação, revise os procedimentos de manipulação do equipamento nesta seção. Falha em observar a forma adequada de manejo do equipamento pode resultar em serias lesões ou morte de funcionários e/ou danos ao equipamento.

	ATENÇÃO! PARA ASSEGURAR O EQUILÍBRIO E ORIENTAÇÃO ADEQUADOS E PREVENIR DANOS AOS COMPONENTES QUANDO A UNIDADE FOR LEVANTADA, SÓ FIXAR AS CORRENTES DE LEVANTAMENTO NOS PONTOS DE ELEVAÇÃO DESIGNADOS. NÃO TENTAR A SUSPENÇÃO POR FIXAÇÃO EM NENHUM OUTRO LOCAL.
	ATENÇÃO! ASSEGURE-SE QUE O DISPOSITIVO DE SUPORTE TENHA CAPACIDADE DE LEVANTAMENTO SUFICIENTE PARA COM SEGURANÇA AGUENTAR O PESO DO EQUIPAMENTO. ABAIXE A CENTRÍFUGA SUAVEMENTE ATÉ SEU LUGAR, VISTO QUE CHOQUES PODEM CAUSAR DANOS.
	ATENÇÃO! NÃO RETIRAR OS SUPORTES DE TRANPORTE ATÉ QUE A CENTRÍFUGA ESTEJA POSICIONADA NO LOCAL FINAL DA INSTALAÇÃO.

SEQUÊNCIA DE INSTALAÇÃO

A seguir a seqüência de passos para a instalação da centrífuga. A sequência apresentada pode variar, dependendo das instalações do utilizador e da experiência anterior com esse tipo de equipamento.

1. Ler e compreender TODAS as informações de segurança na seção 2 antes de instalar e operar este equipamento.
2. Ler e compreender os processos de manipulação do equipamento desta seção antes de suspender e transportar o equipamento.
3. Posicione e nivele o equipamento no local da instalação.
4. Remover os componentes de transporte, e baixar e fixar o conjunto rotativo na base.
5. Ajustar a correia motriz (consulte a Seção 5).

6. Ligue a linha de descarga de líquido.
7. Se o duto de descarga deve ser utilizado, conecte-o à calha de descarga de sólidos.
8. Instale o componente de alimentação, e ligue as linhas de alimentação flexíveis para entrada de material de alimentação e dos flanges de líquido de descarga.
9. Conecte o fornecimento de energia elétrica no equipamento, e conecte a bomba de alimentação aos terminais de controle da bomba de alimentação.
10. Consulte a Seção 4 para procedimentos de inicialização e funcionamento.

REQUISITOS DE PREPARAÇÃO DO LOCAL E ESPAÇO LIVRE

Espaço suficiente deve ser fornecido ao redor do equipamento para facilitar o acesso para manutenção, inspeção e ajustes.

Operação típica e funções de manutenção incluem as seguintes atividades:

1. Acesse e opere o painel de controle de sistema.
2. Abrir e fechar a porta do gabinete de controle (Figura 3-1).
3. Abrir e fechar a tampa superior.
4. Engraxe os rolamentos do conjunto rotativo
5. Verificar e abastecer a caixa de engrenagens.
6. Conectar e desconectar as linhas de alimentação e de descarga de liquido.

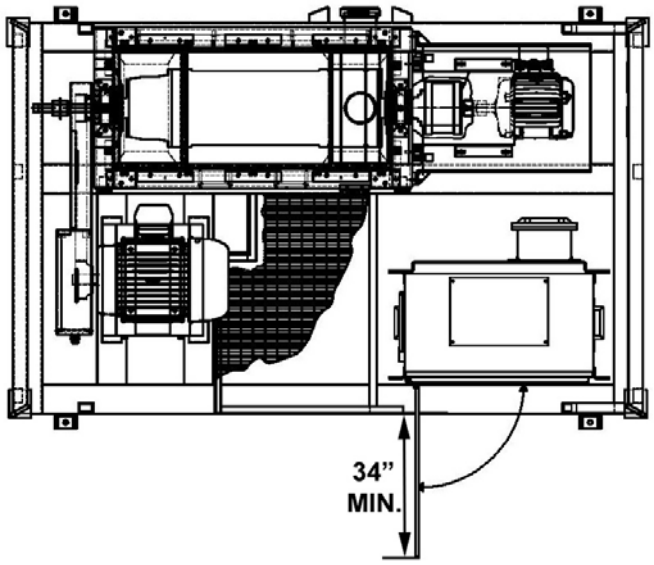


Figura 3-1 Espaço Livre Requerido da Porta do Gabinete de Controle

NIVELAMENTO DO EQUIPAMENTO

A centrífuga deve estar bem nivelada para um funcionamento satisfatório. O equipamento deve ser nivelado por todo o comprimento e largura da unidade (Figura 3-2). Um Nivelador 2-foot ou torpedo nível é recomendado. Calços não compressíveis devem ser usados, caso seja necessário, para o nivelamento da máquina.

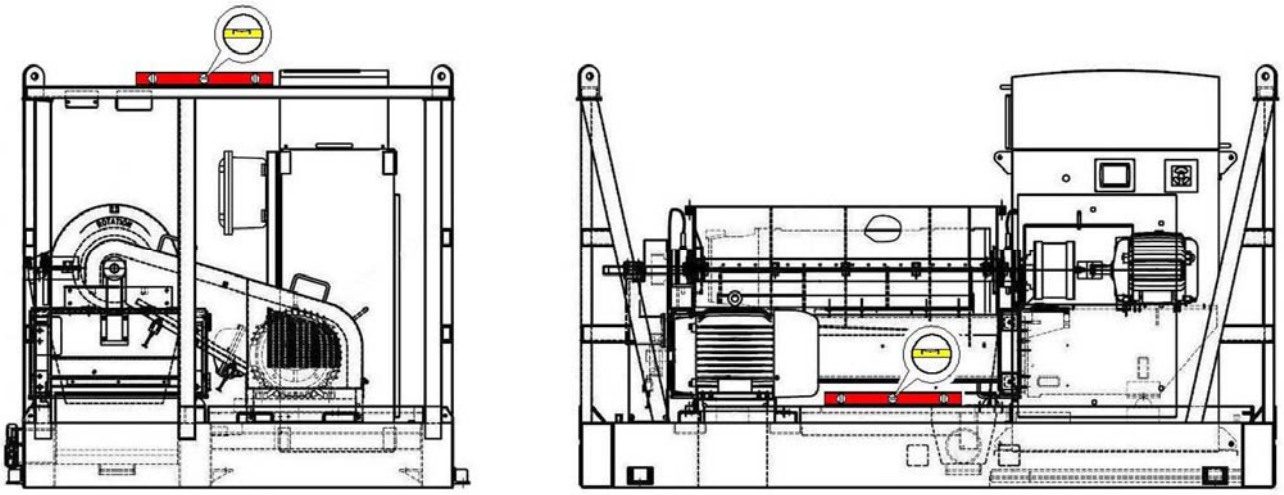


Figura 3-2 Nivelamento da Centrífuga

DESCIDA E FIXAÇÃO DO CONJUNTO ROTATIVO

Note! Guarde os suportes de transporte que apóiam o conjunto rotativo após a remoção. Os suportes devem ser reinstalados sempre que a máquina for movida, visto que evitam danos aos rolamentos do conjunto rotativo durante o transporte.

Os suportes de transporte evitam danos aos rolamentos durante o transporte, e as tiras de borracha protegem as superfícies de montagem do pillow block. Após o posicionamento e nivelamento final da centrífuga, os suportes de transporte e tampas devem ser removidos e o conjunto rotativo fixado à base.

Cada componente de transporte é etiquetado **DESCONECTE ANTES DE INICIALIZAR.** Para remover os componentes de transporte, faça o seguinte:

1. Remova o protetor da correia e o protetor da caixa de engrenagens. Abra a tampa do invólucro.
2. Usando um guindaste de 1-tonelada, eleve o conjunto rotativo lentamente e niveladamente até cerca de 5".
3. Remova os suportes de transporte sob o conjunto rotativo.
4. Retire as tiras de borracha de transporte sob o conjunto rotativo e rolamentos pillow block (Figura 3-3).
5. Usando um solvente adequado, limpe as superfícies de montagem do pillow block e furos de alinhamento. Verifique e remova quaisquer entalhes ou rebarbas.
6. Lentamente abaixe o conjunto rotativo até a base de contato do pillow block, mas o mantenha suportado pelo guindaste.
7. Aplique composto antiaderente nos parafusos do pillow block e pinos de alinhamento afilados.
8. Inserir os fixadores e pinos de alinhamento do pillow block através dos pillow blocks. Bata os pinos de alinhamento no lugar.
9. Aperte os parafusos do pillow block e solte o guindaste. Aperte os parafusos do pillow block de acordo com a especificação de torque aplicável encontrada na Seção 5.

10. Ajuste as portas efluentes, se necessário, da configuração de fábrica de 3,4.
11. Feche a tampa do invólucro e uniformemente aperte todos os parafusos de cobertura sequencialmente começando no centro e se deslocando em direção às extremidades.
12. Gire manualmente o recipiente para confirmar que nenhuma ligação ou esfregão está presente.
13. Ajuste a tensão das correias motrizes de acordo com a Manutenção Preventiva na Seção 5.
14. Instale o protetor das correias e o protetor da caixa de engrenagem.

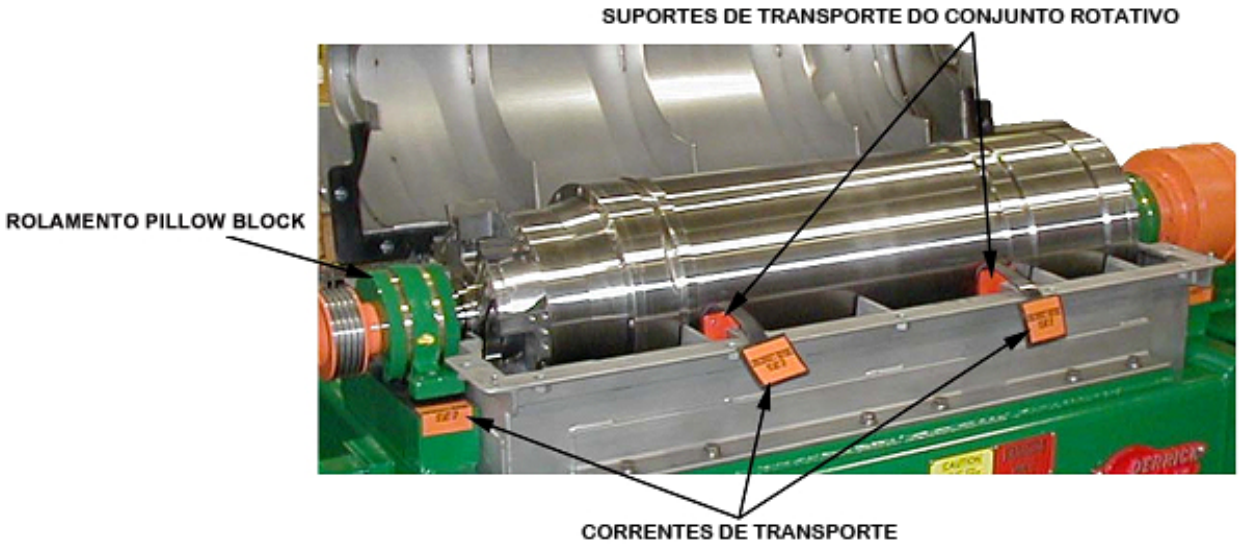


Figura 3-3 Localização dos Componentes de Transporte

CONEXÕES DE ALIMENTAÇÃO E DESCARGA

Para o isolamento de vibração, uma linha flexível deve ser conectada ao tubo de alimentação. Uma fonte de água fresca é necessária para um enxague com jato de liquido de limpeza na centrífuga antes de desliga-la. Para conectar a linha de enxague, instale uma conexão em T na linha de alimentação com válvulas de corte para permitir a seleção ou da linha de alimentação ou da linha de enxague (Figura 3-4). As válvulas de fechamento são necessárias para evitar que a água de enxague retorne à alimentação da centrífuga.

Se uma linha de descarga de líquidos (fornecido pelo cliente) é usada, uma linha flexível é necessária para o isolamento de vibração. Visto que o bolo descartado é muito pesado e viscoso por causa da falta de líquido livre, a centrífuga deve ser instalada sobre o recipiente que vai receber os sólidos descartados. Se isso não for possível, um escorregador ou calha é necessário para transportar os sólidos. Um ângulo de pelo menos 45 graus é necessário para garantir a auto-limpeza, ou um sistema de lavagem deve ser fornecido para evitar acúmulo de material.

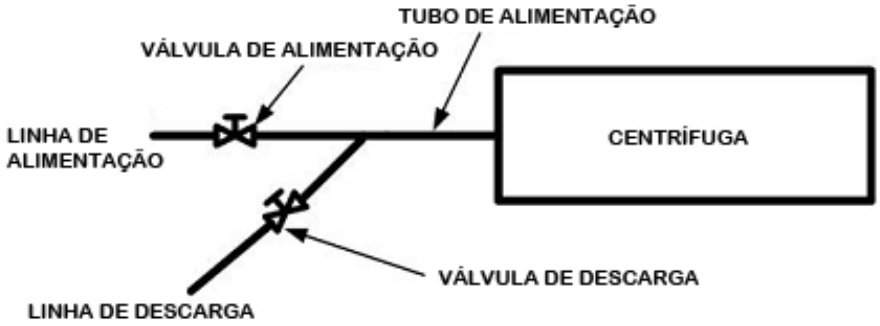


Figura 3-4 Conexões de Alimentação e Descarga

ABASTECIMENTO DE ÁGUA DOCE

É necessária uma linha de água fresca com válvula de fechamento tipo esfera para facilitar a diluição dos dejetos e quando necessário para a execução da limpeza antes do desligamento. A linha deve ser conectada à centrífuga, usando um T na linha do tubo de alimentação.

AR COMPRIMIDO

Para operação do gabinete de controle em um ambiente perigoso, uma fonte de ar filtrado, seco e comprimido a 60 a 115 PSI é necessária para o funcionamento do sistema de drenagem. Consulte a Seção 10 para o tamanho da linha de fornecimento e requerimentos de taxas de fluxo.

BOMBA DE ALIMENTAÇÃO

O cliente deve fornecer uma bomba de alimentação de deslocamento positivo para alimentar a centrífuga com lama. Uma bomba de cavidade progressiva com caixa de engrenagem de taxa fixa e motor acionador de bomba de impulso inverso máxima de 15HP é recomendada. O motor deve ser capaz de operar a velocidades de 180 a 2700 RPM, em 6 a 90 Hz e também cumprir todos os outros requisitos das aplicações, incluindo tensão, frequência e área de classificação. O tamanho, motor e taxa da caixa de engrenagem da bomba devem ser escolhidos para entregar o fluxo máximo desejado à velocidade do rotor da bomba (determinada pelo fabricante) sendo baixo o suficiente para evitar desgaste acelerado do rotor e/ou estator.

A bomba deve ser conectada ao sistema de controle da centrífuga como descrito em Conexões de Energia Elétrica nesta seção para que sua operação possa ser supervisionada pela centrífuga.

INSPEÇÃO DO CONECTOR PLC

Ocasionalmente, vibrações durante o transporte podem resultar em desengates de conexões com o PLC. Como resultados das condições insatisfatórias da fiação podem ocorrer avarias à centrífuga.

Antes de aplicar energia à centrífuga, confirme que todos os conectores do PLC estão seguramente mantidos como descrito no procedimento a seguir. Além disso, a direção de rotação dos motores deve ser verificada antes da partida inicial.

Este procedimento deve ser usado após a entrega do equipamento ao local e antes de ligar e aplicar energia ao equipamento. Sua finalidade é garantir que todos os conectores do PLC estão totalmente conectados.

Este procedimento também deve ser usado como uma etapa inicial de resolução de problema em caso de mau funcionamento do sistema de controle da centrífuga. Sempre verifique se há conexões inadequadas antes de concluir que o mau funcionamento do equipamento é devido a um PLC ou outro componente defeituoso.

Para executar a inspeção do PCL, faça o seguinte:

ATENÇÃO! PARA EVITAR SÉRIAS LESÕES FISICAS CERTIFIQUI-SE DE QUE O EQUIPAMENTO ESTÁ BLOQUEADO E ETIQUETADO (LOTO), DESENERGISADO, ANTES DE ABRIR O GABINETE DE CONTROLE PARA EXECUTAR ESTE PROCEDIMENTO.

1. Com energia elétrica desligada, desconectada, e bloqueado e etiquetado (LOTO), abra a porta do gabinete.
2. Verificar a posição das abas de inserção do conector em cada seção do PLC, conforme mostrado nas fotos abaixo. Para garantir que os conectores estejam totalmente conectados, ambas as abas devem estar inseridas completamente em seus respectivos slots (Figura 3-5).
3. Se a inspeção revelar que alguma das abas moveu-se, deslize a(s) aba(s) totalmente para dentro do slot(s).
4. Após concluir a inspeção e ações corretivas, se necessárias, feche e proteja a porta do gabinete de controle, e prossiga com o processo de inicialização.

Saída do Conector (Cont.)

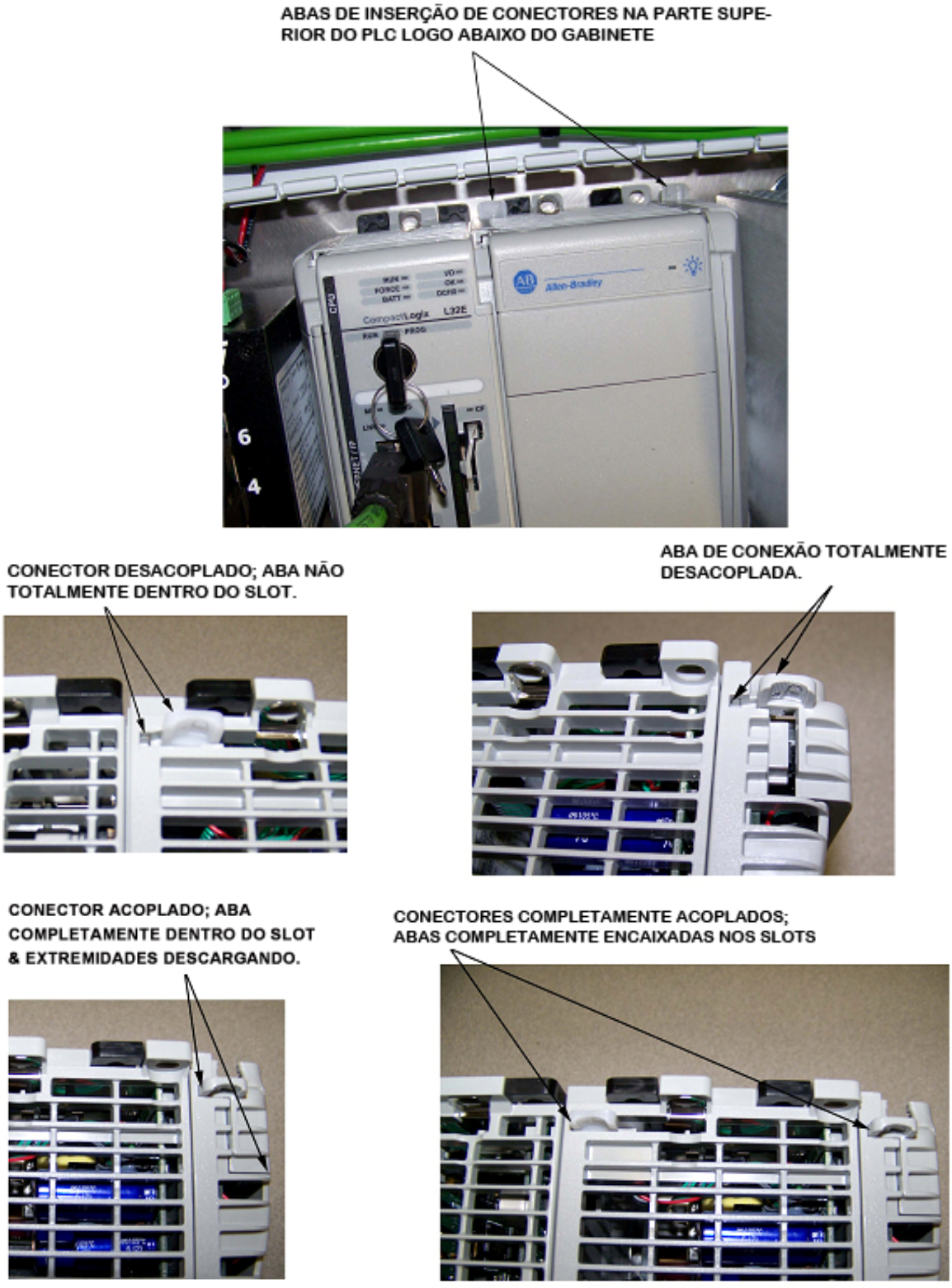


Figura 3-5 Verificação de engate da Aba do conector PLC

CONEXÕES DE FORÇA ELÉTRICA

Os motores de acionamento da centrífuga requerem energia de linha trifásica e aterramento. Além disso, a bomba alimentação do cliente deve ser ligada ao sistema de controle da centrífuga. Conecte a fonte elétrica trifásica e o motor da bomba de alimentação das instalações aos blocos terminais na parte inferior do lado esquerdo do gabinete de controle, como mostrado na Figura 3-6. O sistema de controle pode operar um motor de acionamento da bomba de alimentação de 12.5KW.

A potência de entrada para a centrífuga é trifásica de 50 ou 60 Hz fornecida na tensão definida pelo cliente. Os motores **de acionamento do recipiente e da centrifuga não são bivolt** e deve ser operado na tensão projetada. Para obter as especificações do motor, consulte a Seção 8.

Consulte os diagramas esquemáticos da centrífuga na seção 8 para obter ajuda e informações adicionais sobre as conexões elétricas.

	ATENÇÃO! A CENTRÍFUGA DEVE SER OPERADA NA VOLTAGEM DE FORNECIMENTO DESIGNADA.
	ATENÇÃO! ALTA TENSÃO PODE ESTAR PRESENTE. TENHA CERTEZA QUE O FUSÍVEL QUE DISCONECTA O FORNECIMENTO DE ENERGIA ELETRICA DESTE EQUIPAMENTO ESTÁ ABERTO. BLOQUEI E ETIQUETE (LOTO) O SUPRIMENTO DE ENERGIA PARA PREVENIR APLICAÇÃO ACIDENTAL DE ENERGIA ENQUANTO CONEXÕES ELETRICAS SÃO FEITAS.
	ATENÇÃO! CONEXÕES ELÉTRICAS DEVEM SER FEITAS DE ACORDO COM O CÓDIGO ELÉTRICO NACIONAL (NEC) E TODOS OS CÓDIGOS LOCAIS APLICÁVEIS. FALHA NO CUMPRIMENTO PODE RESULTAR NUMA CONDIÇÃO PERIGOSA QUE PODERIA MACHUCAR ALGUEM OU DANIFICA O EQUIPAMENTO. ASSEGURAR-SE QUE TODAS AS CONEXÕES ELÉTRICAS E DE CONDUITES ESTÃO SEGURAS.

Uma fonte de alimentação primaria desconectada por fusível é necessário para este equipamento. A fonte de alimentação primaria desconectada por um fusível e os cabos de interligação com o equipamento devem ser de tamanho adequado e em conformidade com o Código Elétrico Nacional (NEC) e todas as normas estaduais e municipais aplicáveis.

Os requisitos adicionais de cabeamento são os seguintes:

1. O dispositivo de desconexão por fusível deve ter capacidade de interrupção suficiente para segurar a falta máxima de capacidade de corrente do sistema de abastecimento de energia.
2. As conexões do GND no gabinete de controle e na caixa de conexões do sistema de sensor devem ser conectadas a um aterramento conhecido.

CONEXÕES DE FORÇA ELÉTRICA (CONT.)

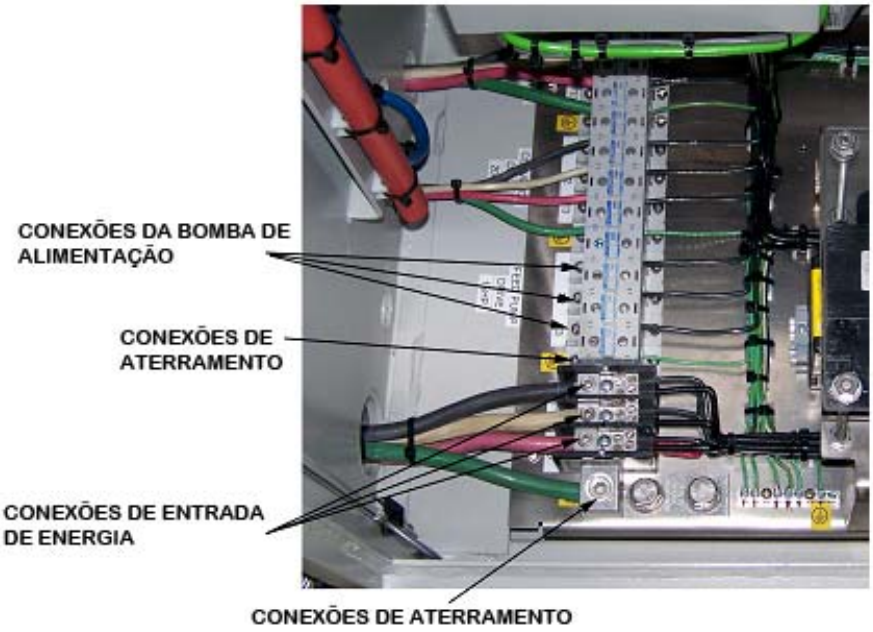


Figura 3-6 Energia de Entrada e Conexões de Bomba de Alimentação para o Gabinete de Controle

TESTE DE POLARIDADE

ATENÇÃO! CERTIFIQUE-SE QUE OS MOTORES ROTACIONAM NA DIREÇÃO CORRETA. POLARIDADE INCORRETA DO MOTOR DO TRANSPORTADOR FARÁ COM QUE O MOTOR DO TRANSPORTADOR ROTACIONE A UMA VELOCIDADE INCORRETA, RESULTANDO EM PROBLEMAS DE PROCESSAMENTO.

No procedimento a seguir, a polaridade é vital. Certifique-se que todos os motores giram na direção correta. Apenas verificar se os sólidos são descarregados da extremidade de sólidos NÃO assegura a polaridade correta!

Se o motor do transportador estiver mal conectado, o transportador pode ficar obstruído ou inundado, dependendo das definições de velocidade do recipiente e do transportador. Teste a polaridade correta de todas as conexões da seguinte forma:

1. Ligue a centrífuga.
2. Acione o recipiente a 20 RPM com uma velocidade diferencial do transportador de 5 RPM.
3. Confirme o sentido de rotação para o recipiente, transportador, bomba de alimentação e motores do condensador de ar condicionado do seguinte modo:
   a. Recipiente - Em sentido anti-horário visto da extremidade do ventilador
   b. Transportador - Em sentido anti-horário visto da extremidade do ventilador
   c. Bomba de alimentação - Dados do fabricante
   d. Condensador do ar condicionado - Em sentido horário visto da extremidade do ventilador

4. Corrigir rotação inversa desligando a energia e mudando dois dos três terminais de energia no(s) bloco(s) terminal dentro do gabinete (veja a Figura 3-6 e diagrama elétrico esquemático na Seção 8).

INICIALIZAÇÃO DE MÁQUINA

Consulte a Seção 4 para a primeira inicialização e procedimentos de operação para a centrífuga.

ATENÇÃO! NÃO TENTE OPERAR A MÁQUINA COM COMPONENTES DE TRANSPORTE INSTALADOS.

SEÇÃO 4 - INSTRUÇÕES OPERACIONAIS

GERAL

Os procedimentos desta seção são para uso apenas por pessoal treinado qualificado para operar equipamento de alta velocidade de rotação. Procedimentos de inicialização inicial e normal, operação, desligamento e desligamento de emergência estão incluídos. Após a inicialização e os procedimentos de operação, informações detalhadas são fornecidas nas telas de controle para auxiliar o operador e técnico na compreensão da operação da centrífuga e a utilizar plenamente sua capacidade.

A centrífuga é projetada para ser utilizada apenas para os fins previstos no momento da compra. A operação em qualquer outra aplicação requer a consulta do setor de engenharia Derrick.

SEGURANÇA OPERACIONAL

	ATENÇÃO! TODOS OS FUNCIONÁRIOS DE OPERAÇÃO E DE MANUTENÇÃO DEVEM LER E ENTENDER TODAS AS INFORMAÇÕES DE SEGURANÇA DESTE MANUAL ANTES DE TRABALHAR COM O EQUIPAMENTO.
	ATENÇÃO! ASSEGURE-SE QUE TODAS AS TAMPAS ESTÃO FECHADAS E SEGURAS E TODOS OS FUNCIONÁRIOS FORAM REMOVIDO ANTES DA MÁQUINA COMEÇAR A FUNCIONAR.
	ATENÇÃO! ASSEGURE-SE QUE TODOS OS COMPONENTES DE TRANSPORTE FORAM RETIRADOS E OS ROLAMENTOS PILLOW BLOCKS ESTÃO DEVIDAMENTE APERTADOS.
	ATENÇÃO! SEMPRE PERMITA QUE A MÁQUINA DESACELERE ATÉ UMA PARADA COMPLETA ANTES DE ABRIR A TAMPA SUPERIOR OU REMOVER OS PROTETORES.
	ATENÇÃO! NÃO OPERAR A CENTRÍFUGA SE ELA DESENVOLVER BARULHO OU VIBRAÇÃO EXCESSIVA. SEMPRE CONFIRME QUE O INTERRUPTOR DE VIBRAÇÃO E OUTROS DISPOSITIVOS DE SEGURANÇA ESTÃO FUNCIONANDO.

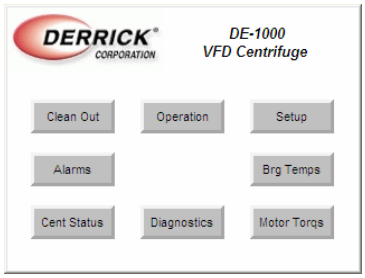
SISTEMA DE DRENAGEM (APENAS AMBIENTES PERIGOSOS)

Só centrífugas que funcionarão em ambientes perigosos são equipadas com sistema de drenagem. Durante a inicialização, o sistema de drenagem dirige para fora todos os gases do interior do gabinete e, em seguida, mantem a pressão positiva dentro do gabinete de controle para evitar a entrada de potenciais gases explosivos. O funcionamento do sistema de drenagem é iniciado quando a pressão de ar suficiente é sentida dentro do gabinete. Um ciclo de drenagem rápida de 14 minutos a 16 CFM ocorre, enquanto o sistema de drenagem evita que a energia seja aplicada ao interior do gabinete. No final do ciclo de drenagem rápida, o sistema de drenagem fecha o contator principal que permite à energia fluir para o interior do gabinete. A drenagem de 2 CFM contínua começa e continua durante e após a operação de centrifugação. É preferível manter o gabinete pressurizado. Se em algum momento uma perda de pressão do gabinete for detectada, o contator principal será aberto imediatamente, desligando a energia. A drenagem rápida de 14 minutos é repetida antes da energia ser re-estabelecida.

PRIMEIRA INICIALIZAÇÃO

Execute o procedimento de inicialização inicial quando a centrífuga estiver sendo iniciado pela primeira vez após a instalação ou depois que a máquina tenha sido transferida.

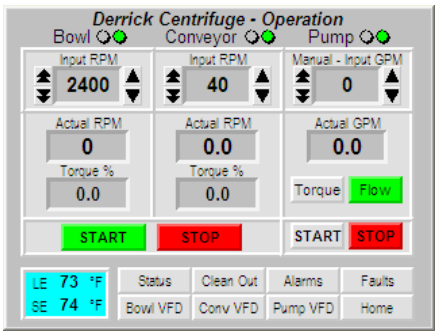
1. Todas as ferramentas, documentos e componentes de transporte foram removidos e não existem obstáculos para a operação.
2. Verifique se todos os funcionários estão longe do equipamento.
3. Confirme que todos os funcionários de operação e manutenção leram e compreenderam todas as informações sobre o funcionamento e segurança na Seção 2.
4. Verifique se o equipamento foi instalado corretamente, todos os suportes de transporte foram removidos e os rolamentos pillow block foram apertados com o torque especificado na Seção 5.
5. Para o gabinete a prova de explosões, ligue o ar comprimido para o sistema de drenagem.
6. Ligue e centrífuga. A seguinte tela aparecerá (no armário à prova de explosão, será exibida após o ciclo de drenagem ser concluído):



7. Sem a centrifugação estar em andamento, execute as seguintes verificações de segurança para confirmar se as conexões entre o gabinete de controle e centrífuga estão corretas:
   - Opere os botões de parada de emergência na caixa de junção e no gabinete de controle, e procure pela mensagem de alarme de Parada de emergência no painel de comando.
   - Solte os botões de paragem de emergência para limpar a mensagem de alarme.
   - Bata na carcaça do Interruptor de vibração horizontalmente com um martelo de borracha ou de couro cru, e verificar se há mensagem de falha para alta vibração no painel de controle.

- Pressione o botão de restaurar no interruptor de vibração para limpar a mensagem de alarme.

8. Selecione *Cent. Status* para verificar se a máquina está pronta para a operação. Corrigir quaisquer deficiências antes de prosseguir com o processo de inicialização. Se a condição for satisfatória, clicar no canto superior direito para retornar à *tela* inicial.
9. Selecione *Configuração* e clique em Configurações da Bomba para visualizar as informações operacionais da bomba. Revisar quaisquer informações operacionais, se necessário, e clique no canto superior direito para retornar à tela de configuração. Selecione *Home* para retornar à tela inicial.
10. Selecione *Operação* para visualizar a seguinte tela:

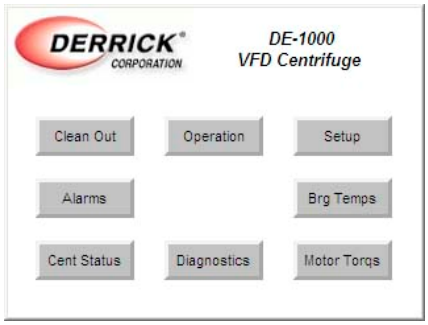


11. Usando as teclas de seta para cima e para baixo, defina o RPM do recipiente em 20 RPM, e o RPM de entrada do conjunto transportador em 5 RPM. Confirme o sentido de rotação para o recipiente, transportador, bomba de alimentação e motores do condensador de ar condicionado do seguinte modo:
    - Recipiente - em sentido anti-horário visto da extremidade do ventilador
    - Transportador - em sentido anti-horário visto da extremidade do ventilador
    - Bomba de alimentação - Dados do fabricante
    - Condensador do ar condicionado - em sentido horário visto da extremidade do ventilador
12. Corrigir rotação inversa desligando a energia e mudando dois dos três terminais de energia no(s) bloco(s) terminal dentro do gabinete (veja a Seção 3 e diagrama elétrico esquemático na Seção 8).
13. Iniciar centrífuga de acordo com procedimento de Inicialização Normal abaixo, começando pelo 4º passo.

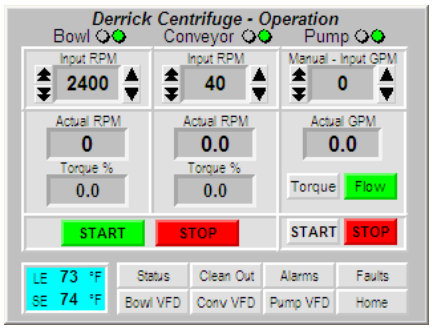
INICIALIZAÇÃO NORMAL

1. Com a energia elétrica desligada abra manualmente a tampa do conjunto do recipiente rotativo para verificar se o recipiente gira livremente e sem atrito perceptível.
2. Feche a tampa, aperte todos os parafusos da tampa a torque exigido (ver seção 5), e assegure-se que todos os protetores estão no local.
3. Verifique se todos os funcionários estão longe da centrífuga e todas as proteções estão nos seus locais antes de fornecer energia elétrica para o equipamento.
4. Apenas para o gabinete a prova de explosões, ligue o ar comprimido para inicializar o ciclo de drenagem do gabinete.

5. Ligue e centrífuga. A seguinte tela aparecerá (no armário à prova de explosão, será exibida após o ciclo de drenagem ser concluído):



6. Com a Tela Inicial sendo exibida, selecione Operação para visualizar a seguinte tela:



7. Usando seta para cima e para baixo, defina os RPMs de entrada do recipiente e do conjunto transportador na velocidade desejada.

Note! A velocidade do recipiente deve ser definida no mínimo em 750 RPM.

8. Duas opções estão disponíveis para o controle da bomba de alimentação. Se o controle automático for desejado pelo PLC, selecione Torque. O GPM da bomba será automaticamente alternado se baseado no percentual de torque do recipiente e do transportador. Selecione Fluxo para o operador determinar o GPM da bomba. Note que, mesmo com o fluxo selecionado o PLC vai variar o GPM da bomba ou até mesmo desligar a bomba se torque excessivo for detectado.
9. Selecione INICIAR para ativar a centrífuga. Note que a velocidade do recipiente e do transportador vai aumentar gradualmente até atingir suas configurações, e a % de Torque para o recipiente e o transportador aumentará.
10. Quando a velocidade do recipiente atingir a velocidade determinada, selecione INICIAR Bomba para inicializar a bomba de alimentação, e lentamente introduzir alimentação à centrifugar.

Note! A bomba não inicializará até que a velocidade real do recipiente seja determinada em aproximadamente 120 RPM.

11. Ajuste a taxa de alimentação, a velocidade do recipiente e/ou a velocidade do transportador como necessário para melhorar a operação da centrífuga. Selecione a tela de *Dados* em

qualquer momento para revisar e monitorar as características operacionais da centrífuga, incluindo o status do ar-condicionado, tempo de funcionamento decorrido, e os dados do VFD.

Note! Dependendo da configuração de velocidade diferencial do transportador, em uma velocidade do recipiente acima de 300 RPM o motor do transportador pode girar na direção oposta.

OPERAÇÃO

Propriedades da lama/pasta de entrada e separação desejada deve ser conhecidos antecipadamente. Esta informação pode ser usada para definir e alterar a velocidade do recipiente, a velocidade diferencial do transportador e a taxa de alimentação (menos quando definido para controle automático), como necessário, durante o funcionamento da centrífuga. Monitoração contínua das indicações do painel de controle da centrífuga, bem como a condição da lama/pasta de entrada, é essencial para alcançar a clareza dos efluentes e aridez dos sólidos desejados. Aumento no Torque do transportador indica que um ou mais parâmetros de funcionamento devem ser diminuídos para reduzir o torque. Por outro lado, Queda no torque do transportador indica que a velocidade e/ou taxa de alimentação podem ser aumentadas. Os parâmetros operacionais devem ser ajustados, se necessário, para otimizar a operação da centrífuga e prevenir desligamentos automáticos devido a excessivo torque do transportador ou recipiente.

A tela *de operação* (Figura 4-1) permite ao operador visualizar informações do funcionamento atuais do recipiente, transportador, e da bomba, e ajustar os parâmetros conforme necessário para atender às condições de mudança. Através desta tela, o operador pode visualizar e definir as percentagens de RPMs e torque do recipiente e do transportador, definir a taxa de fluxo da bomba de alimentação, e visualizar as temperaturas dos rolamentos. Ajustes na velocidade do transportador e do recipiente podem ser realizados utilizando as setas para cima e para baixo ou digitando os números reais sobre o teclado numérico. Além disso, opções para parar a centrífuga são fornecidas, exibindo as telas de operação do VFD e selecionando as telas de Status, Limpar, Falhas, Alarmes, e Pagina Inicial.

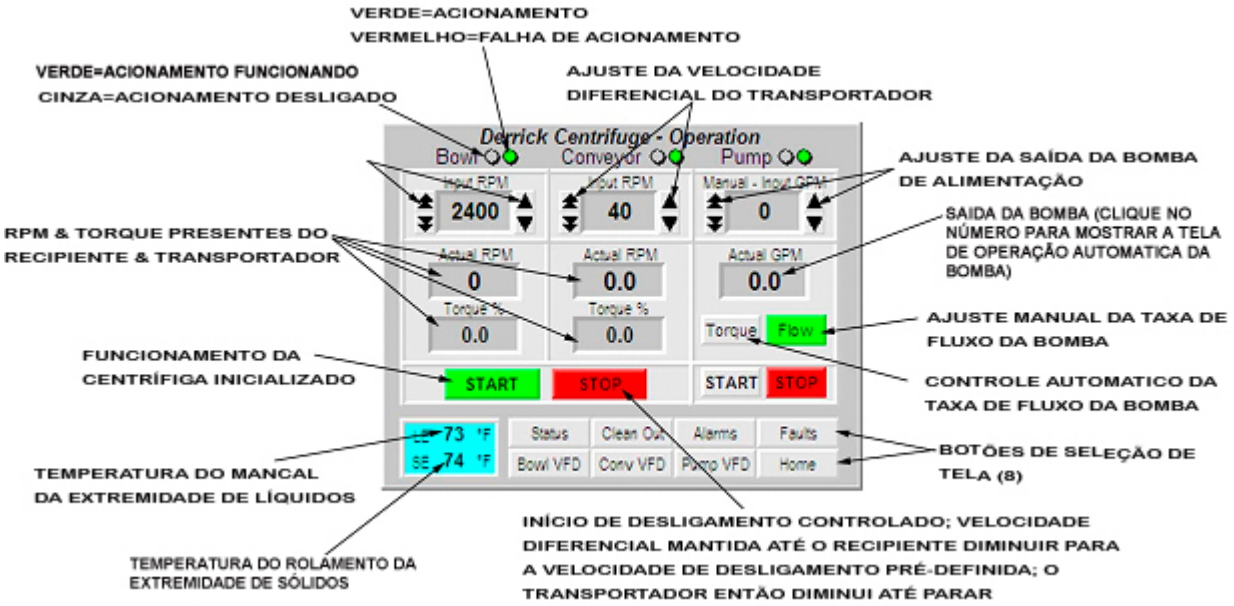


Figura 4-1 Tela de Operação (Folha 1)

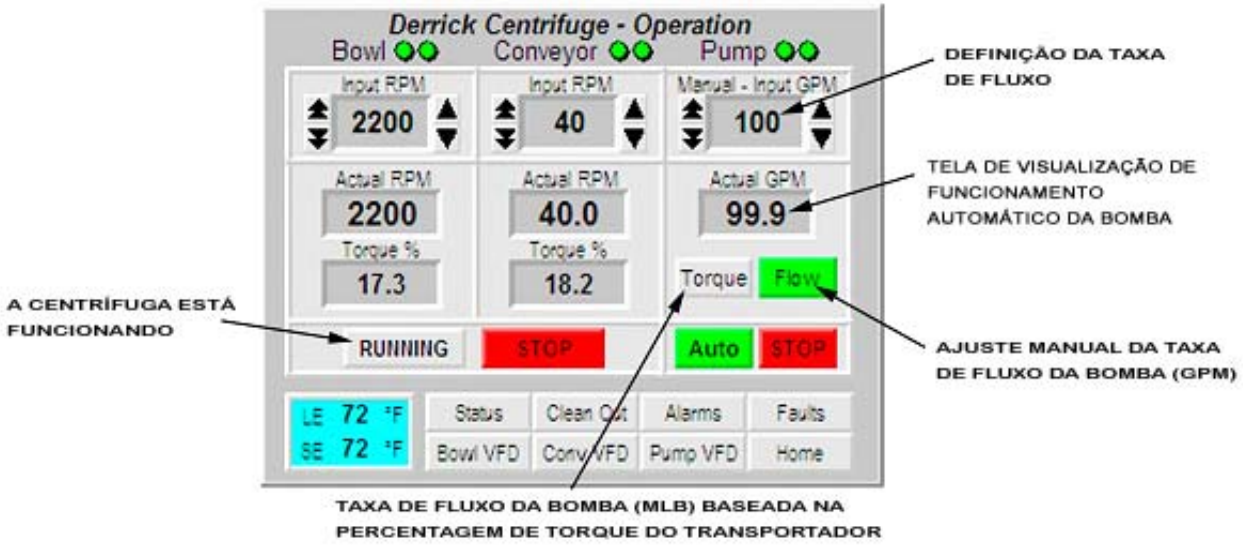


Figura 4-1 Tela de Operação(Folha 2)

Os seguintes parâmetros afetam a operação da centrífuga:

- Taxa de alimentação
- Profundidade do poço
- Velocidade do reservatório
- Velocidade do transportador contínuo

O ajuste de um parâmetro pode produzir a clareza do efluente líquido ou a aridez dos sólidos desejada. Ou o desempenho desejado pode ser atingido com novo ajuste. É importante compreender a interdependência dos parâmetros operacionais. Mudar uma característica resulta em outros efeitos que podem exigir ajustes adicionais.

Exceto pela profundidade do poço, estes parâmetros podem ser ajustados quando a centrífuga está operando. O operador poderá então visualizar os resultados de uma mudança antes de fazer ajustes adicionais. Os parágrafos seguintes descrevem o efeito da mudança de cada parâmetro.

Taxa de Alimentação

Quando o modo Manual está selecionado na tela *de operação,* o operador manualmente digita a taxa desejada na tela de operação. Se a lama for de baixa viscosidade e densidade, aumentar a taxa de alimentação pode permitir uma maior taxa de processamento. No entanto, como a taxa de alimentação é aumentada, o tempo de permanência no recipiente é reduzido, resultando em mais sólidos na descarga de líquido. Além disso, o torque do transportador pode subir indicando que o transportador está ficando sobrecarregado por mover um maior volume de sólidos na sua velocidade atual. Para reduzir o torque do transportador, a velocidade do recipiente pode ser reduzida, a taxa de alimentação pode ser reduzida, ou a velocidade do transportador pode ser aumentada para mover os sólidos para fora mais rápido. A definição de taxa de alimentação e da taxa real de alimentação é mostrada no painel de controle para auxiliar o operador a fazer ajustes.

Velocidade do Recipiente

Quanto mais rápida a velocidade do recipiente, mais rápido os sólidos são sedimentados através do poço até a parede externa do recipiente e transportados para fora da centrífuga, mas processamentos mais rápidos resultam em descargas de sólidos mais úmidos. Para reduzir a umidade, a lama/pasta deve permanecer no recipiente por mais tempo, submetendo-a ao processo determinado por um maior período antes de ser transportada para fora da descarga de sólidos. Por outro lado, reduzir a velocidade do recipiente pode ser interessante quando a lama for grossa e pesada, para extrair apenas material de alta densidade ou partículas grandes.

Tanto a definição da velocidade do recipiente quanto à velocidade real do recipiente são mostradas no painel de controle. O percentual de torque do recipiente também é exibido. Esta informação é útil no incremento da velocidade do recipiente para produzir a aridez dos sólidos e velocidade de processamento desejado.

Velocidade Diferencial do Transportador Contínuo

Com a polaridade correta da fiação, o transportador responde adequadamente às configurações feitas na tela de operação. Alterar a velocidade diferencial do transportador ajusta a taxa de vazão de sólidos. Em geral, uma velocidade diferencial menor irá produzir sólidos mais áridos, mas reduz a taxa de vazão de sólidos. Aumentar a velocidade de transporte reduz o tempo de secagem, levando à descarga de sólidos úmidos. Reduzir a velocidade do transportador resulta na descarga de sólidos secos. No entanto, a velocidade do transportador excessivamente lenta resulta no acumulo de sólidos no recipiente, o que pode causar uma condição de sobrecarga.

O tempo de secagem é reduzido ao se aumentar à velocidade do transportador, o que aumentará a umidade dos sólidos. Reduzir a velocidade diferencial do transportador aumenta o tempo de secagem, o que irá produzir sólidos mais áridos.

Tanto a definição da velocidade do transportador quanto à velocidade real do transportador são mostradas no painel de controle. Além disso, a percentagem de torque do transportador é mostrada para ajudar o incremento da velocidade do transportador para produzir a aridez dos sólidos e velocidade de processamento desejado.

Como a velocidade diferencial do transportador é controlada pelo PLC referente à definição de velocidade do recipiente, a polaridade da fiação dos componentes eléctricos é fundamental. A polaridade elétrica determina a velocidade real do motor e direção do motor do transportador para qualquer definição de velocidade do recipiente. Por exemplo, com uma velocidade do recipiente determinada em 2000 RPM e uma velocidade diferencial do transportador ajustada para 60 o motor do transportador irá rotacionar em inversão de -1120 RPM.

A relação da velocidade do recipiente-transportador correta depende da polaridade correta da fiação. Se a polaridade for invertida, a mesma definição de velocidade do recipiente de 2000 RPM descrita acima resultaria em uma velocidade diferencial real do transportador de cerca de 17 ao invés da definição de 60.

Profundidade do Poço

Quatro portas de efluente ajustáveis (Figura 4-2) são fornecidas na parte superior do recipiente de líquidos para facilitar o ajuste da profundidade do poço, todas as portas devem ser ajustadas igualmente. Uma profundidade maior do poço aumenta o tempo de assentamento, permitindo que mais líquido permaneça no recipiente. No entanto, uma profundidade maior do poço também reduz a área da praia na extremidade de descarga de sólidos do recipiente, que irá resultar em uma descarga de sólidos mais úmidos.

A profundidade do poço só pode ser ajustada com a centrífuga totalmente parada e desabilitada. Por esta razão, a profundidade do poço é normalmente ajustada por último. As definições de fábrica da profundidade do poço são normalmente satisfatórias quando utilizado em conjunto com a taxa de alimentação, velocidade do recipiente, e ajustes de velocidade do transportador. No entanto, se os resultados desejados não poderem ser alcançados por outros meios, a profundidade do poço pode exigir uma redefinição.

Para ajustar a profundidade do poço, faça o seguinte:

ATENÇÃO! NÃO ABRA A TAMPA OU TENTE QUALQUER AJUSTE OU MANUTENÇÃO NA CENTRÍFUGA A MENOS QUE O RECIPIENTE ESTEJA COMPLETAMENTE PARADO.

1. Desligue, bloqueie e etiquete (LOTO) a centrífuga usando o procedimento de Desligamento Normal descrito posteriormente nesta seção.
2. Abra a tampa do invólucro.
3. Solte três parafusos que fixam o anel de montagem da parte superiora do recipiente de líquidos, gire a porta de efluentes até que a configuração desejada esteja posicionada na marca de alinhamento e aperte os parafusos. Todas as quatro portas de efluentes devem ser definidas para a mesma posição.
4. Feche a tampa do invólucro depois de completar os ajustes.

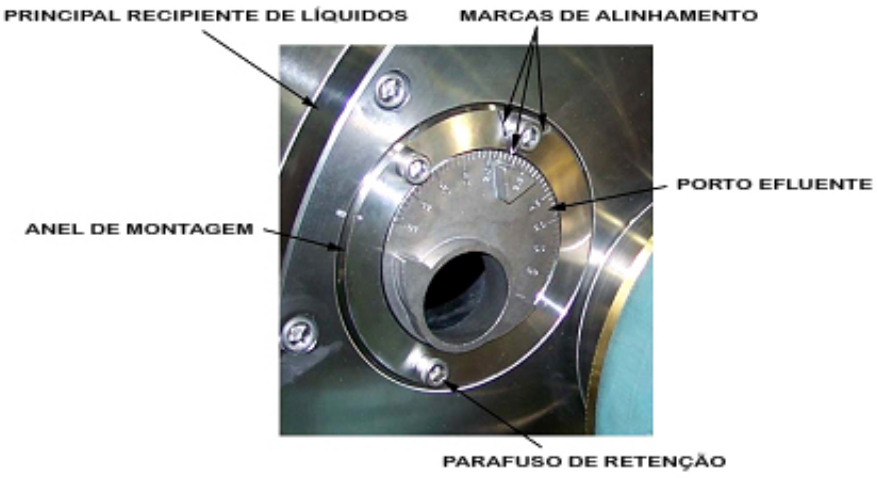


Figura 4-2 Ajustes das Portas de Efluentes

Velocidade Diferencial/Torque do transportador

Geralmente, um transportador mais rápido resulta em torque do transportador mais baixo, visto que sólidos são descargados mais rapidamente e geralmente mais úmidos. A redução da velocidade do transportador deve ser feita lentamente e com cautela, permitindo o estado estacionário ser alcançado antes de uma nova redução. Velocidades do transportador mais lentas permitem aos sólidos permanecer no recipiente por mais tempo. Isto pode permitir o acúmulo de sólidos no recipiente se a taxa de entrada exceder a taxa de descarga. Portanto, o torque deve ser monitorado para evitar a sobrecarga.

As definições de limite de torque controlam a redução de alimentação automática e o desligamento da centrífuga. Conforme aumenta o torque do transportador, a taxa de alimentação é reduzida progressivamente. Se o torque continuar a aumentar, a taxa de alimentação é reduzida mais rapidamente. Ao chegar à definição de torque máximo do transportador, a centrífuga é desligada.

A certa velocidade do transportador o motor de acionamento deve reverter a direção para acomodar a relação da velocidade diferencial com o recipiente. Se isso ocorrer, o sistema de controle da centrífuga automaticamente assume o controle da bomba de alimentação para reduzir a sua taxa de fluxo. A mensagem de "Taxa de Fluxo Automática" aparece na tela de operação para alertar os funcionários que a bomba de alimentação está no controle automático.

Quando a taxa de alimentação reduzida é alcançada, um temporizador de 20 segundos é iniciado. Ao chegar o fim do intervalo cronometrado, uma nova velocidade diferencial do transportador é aplicada para corresponder com a taxa de fluxo revista. A taxa de alimentação da bomba retorna à taxa anterior quando a nova velocidade diferencial é alcançada. O controle manual da bomba de alimentação é então restaurado. Esta ação libera a bomba de alimentação do sistema de controle automático e remove a mensagem Taxa de Fluxo Automático da tela.

MENSAGENS DE ALARME E DE FALHA

Durante a operação da centrífuga, poderá aparecer uma mensagem para alertar o operador sobre uma anomalia que necessite de uma intervenção do operador. Mensagens de alarme significam que o problema prevalecente deve ser corrigido ou a centrífuga pode ser desligada automaticamente. Mensagens de falha informam ao operador que uma falha que exige desligamento automático ocorreu.

Consulte a Seção 5 para mensagens de alarme e as suas causas e ações corretivas.

TEMPERATURAS DO ROLAMENTO

Tendências de temperatura do rolamento podem ser visualizadas em forma gráfica na Tela de Temperatura dos Rolamentos (Figura 40-3). As temperaturas são atualizadas de acordo com um intervalo pré-definido e os botões de deslocamento são fornecidos para facilitar a análise das tendências ao longo do tempo. As temperaturas das extremidades de sólidos e de líquidos são exibidas no lado direito da tela. A tela do Torque do Motor também é acessível a partir da Tela de Temperatura dos Rolamentos. O operador pode retornar à tela Operação ou à tela Inicial usando os botões na parte inferior direita da tela.

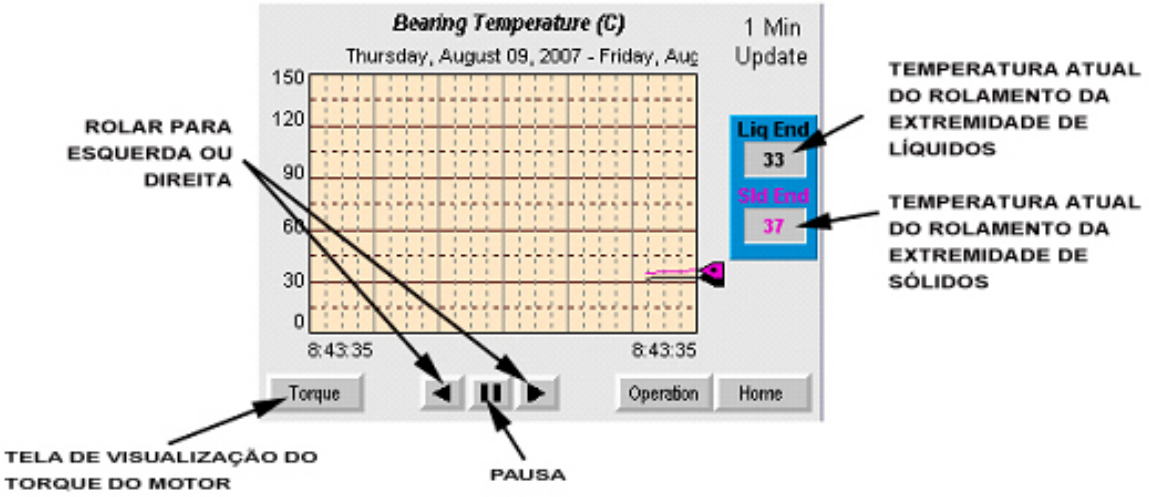


Figura 4-3 Tela de Temperatura dos Rolamentos

TÊNDENCIA DE TORQUE DO MOTOR

O torque do recipiente e do transportador pode ser vistos em forma gráficos na tela de tendência de Torque do Motor (Figura 4-4). Os torques são atualizados de acordo com um intervalo pré-definido (um minuto), e botões de deslocamento são fornecidos para facilitar a análise das tendências ao longo do tempo. Os torques do recipiente e do transportador são exibidos no lado direito da tela. A tela de Temperatura do Rolamento também é acessível a partir da Tela de Torque do Motor. O operador pode retornar à tela Operação ou à tela Inicial usando os botões na parte inferior direita da tela.

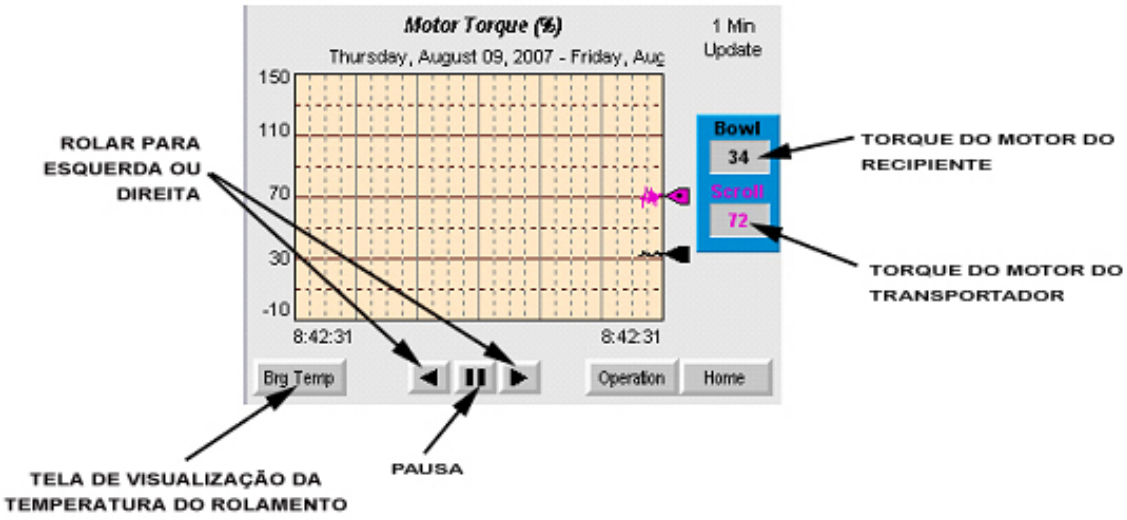


Figura 4-4 Tela de Tendência de Torque do Motor

DIAGNÓSTICOS DE SISTEMA

Diagnósticos de sistema incorporados analisam continuamente o sistema de controle da DE-1000 em busca de falhas. A tela de Diagnósticos (Figura 4-5) auxilia na resolução de problemas, apresentando qualquer falha nas áreas críticas da centrífuga. O estado operacional atual do Recipiente, do Transportador e dos VFDs da Bomba, bem como os sensores de velocidade e temperatura são exibidos na tela. Leituras analógicas em mA são exibidas na parte inferior da tela dos sensores de temperatura do rolamento principal e sensor de velocidade do recipiente. A tela é acessível a partir da tela Inicial, bem como as três telas do VFD.

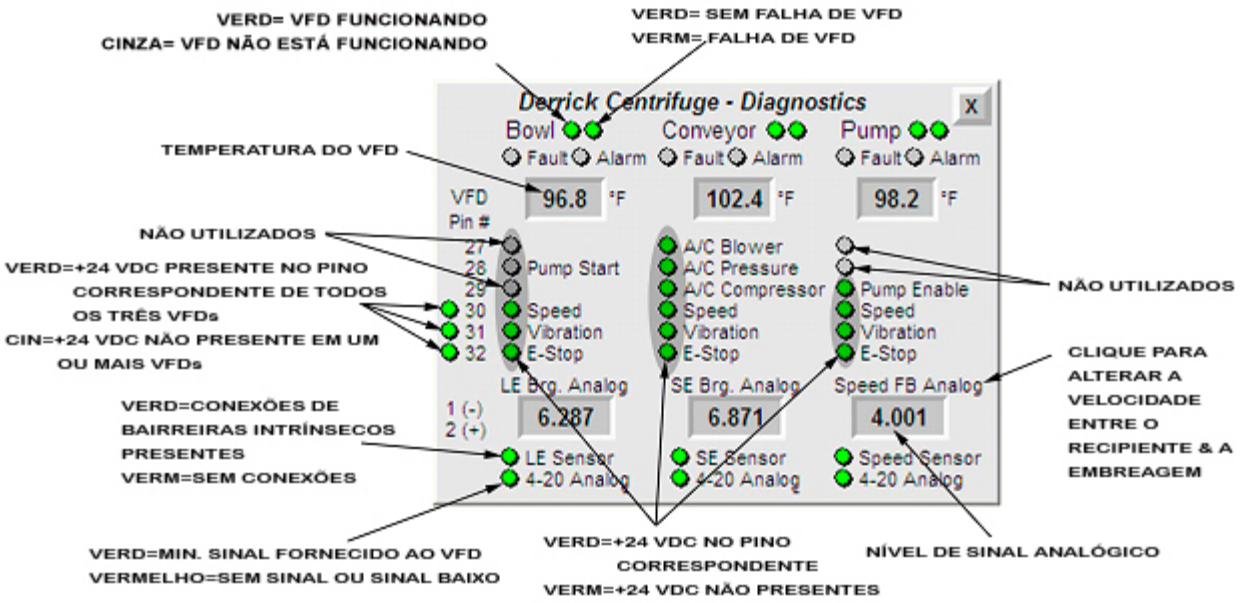


Figura 4-5 Tela de Diagnósticos

STATUS DO DESEMPENHO

Informações sobre o desempenho atual são mostradas na tela *Status da Centrífuga* (Figura 4-6). Os parâmetros exibidos incluem temperaturas de rolamentos, velocidades do recipiente e embreagem, e condição do sensor, status dos dispositivos de segurança (interruptor de vibração, parada de emergência e excesso de velocidade do recipiente), funcionamento do condicionador de ar, e horas de funcionamento. O status de funcionamento do motor do compressor do ar condicionado, motor do ventilador do evaporador e pressão do refrigerante são mostrados. Sair desta tela volta à tela anterior. As falhas são indicadas por uma mudança de cor de verde para vermelho e pela exibição de uma palavra correspondente.

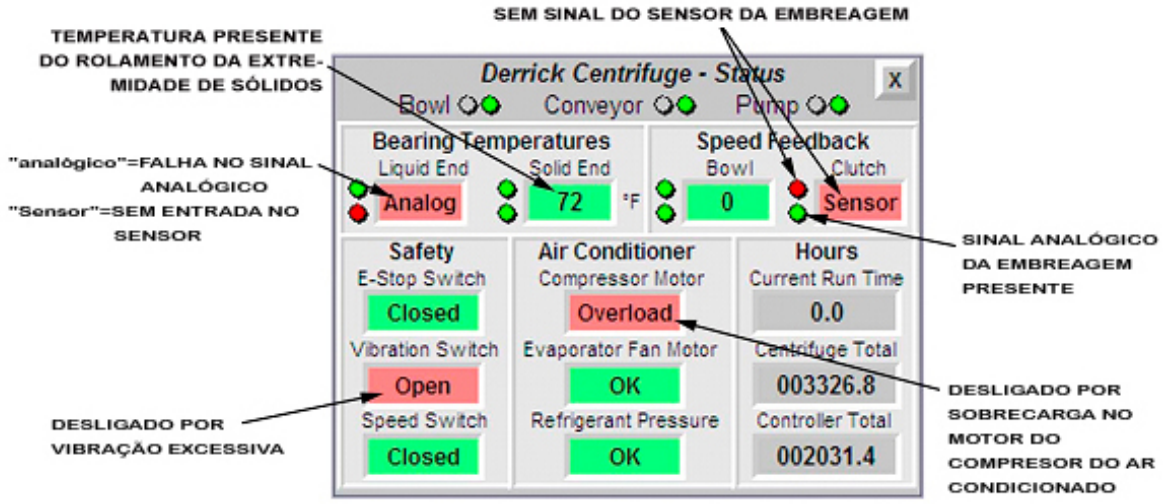


Figura 4-6 Tela de Status da Centrífuga

ALARMES

A tela de Alarmes (Figura 4-7) permite ao operador examinar e reconhecer as mensagens de alarme ativas. Cada alarme é listado com o seu estado, a data e a hora recebida e descrição. Botões são fornecidos na parte inferior da tela para facilitar a navegação entre os alarmes. As mensagens podem ser confirmadas individualmente ou todos os alarmes poderão ser confirmados simultaneamente. Provisões são incluídas para classificar os alarmes em ordem de ocorrência e botões são incluídos para voltar à tela Operação ou à tela Inicial.

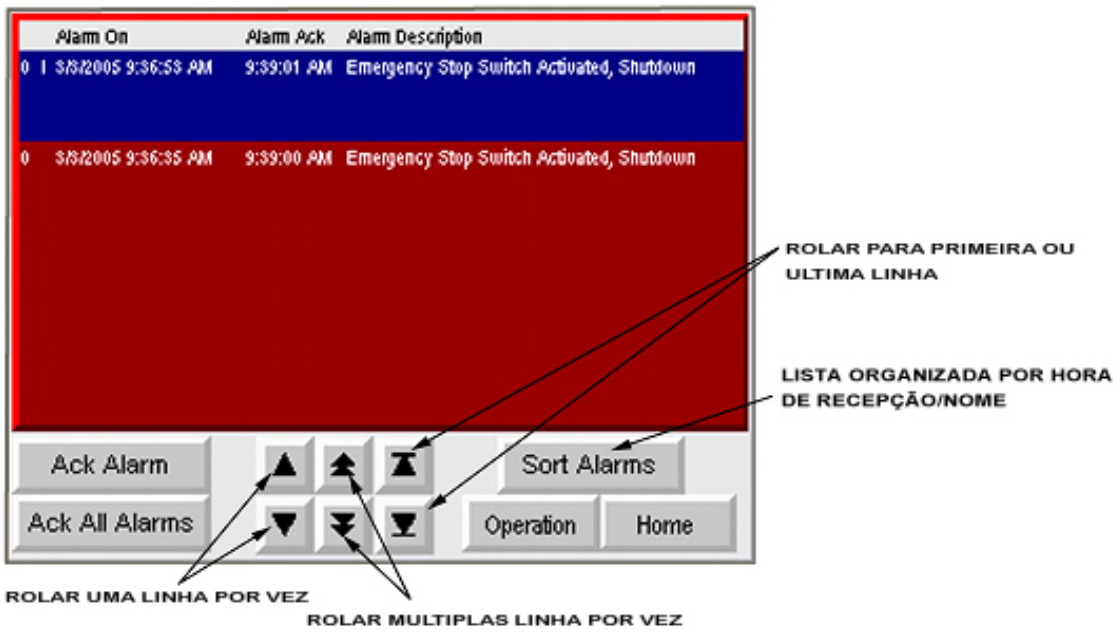


Figura 4-7 Tela de Alarmes

STATUS DO VFD

Uma tela de status é fornecida para cada VFD (Figura 4-8 até 4-10) para permitir a revisão das informações sobre o status atual do VFD. Quando selecionada a partir da tela *Operação,* a tela de status permite ao operador visualizar fatores operacionais tais como, qualquer alarme presente, saída de força, direção do motor (avançando ou parado), temperatura interna do VFD, velocidades do motor e do recipiente e torque do motor. Clicar no campo temperatura exibe a tela de tendência da temperatura do VFD (Figura 4-11).

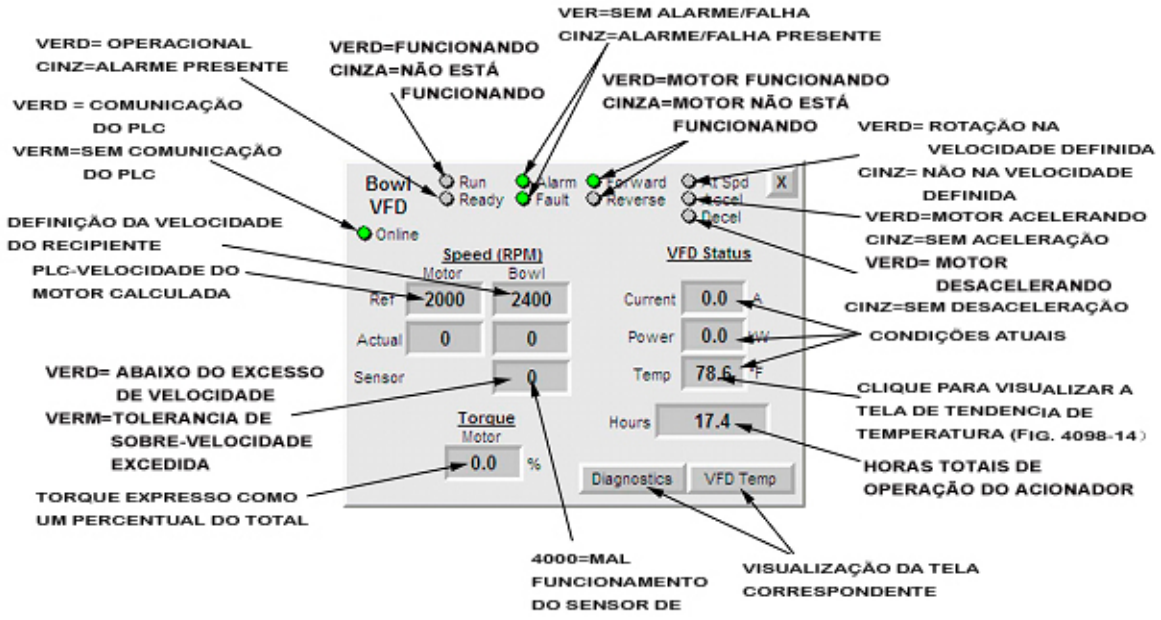


Figura 4-8 Tela do VFD do Recipiente

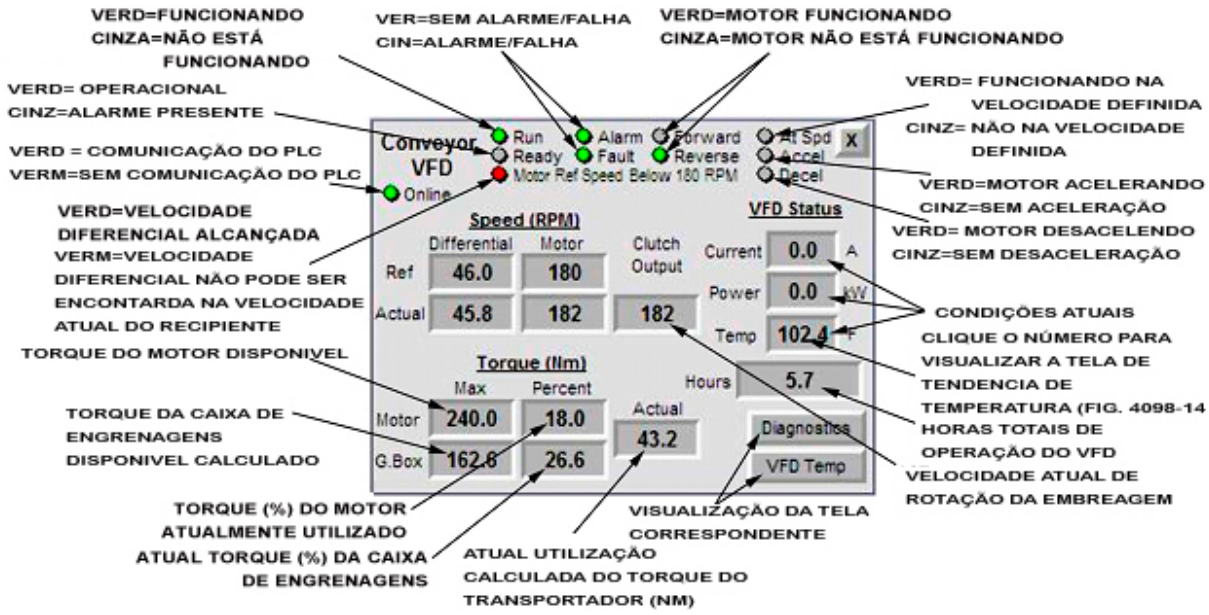


Figura 4-9 Tela do VFD do Transportador

STATUS DO VFD (CONT.)

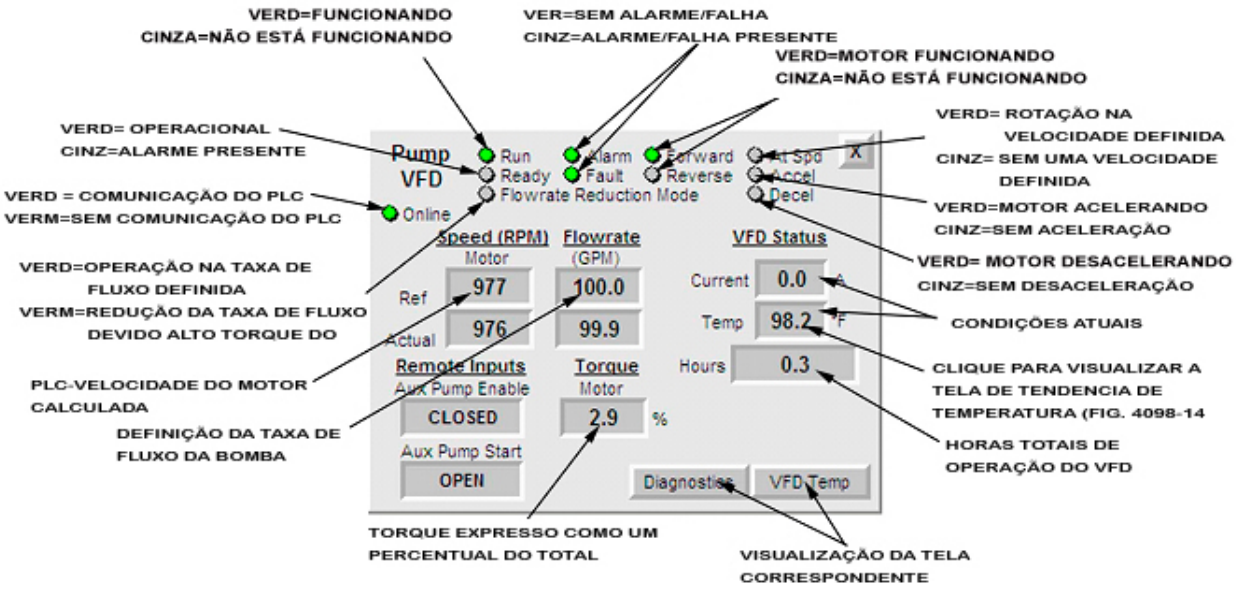


Figura 4-10 Tela do VFD da Bomba

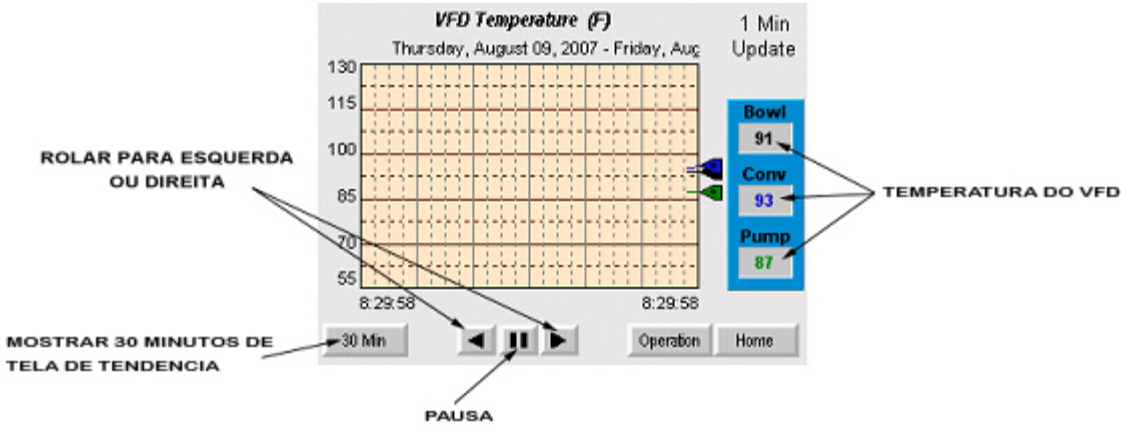


Figura 4-11 Tela Tendência da Temperatura do VFD

RESTAURAÇÃO DE FALHA VFD

A tela de *Reinicialização de Falha* (Figura 4-12) informa o operador da disponibilidade de cada VFD -- Com Falha ou Sem Falha -- e permite reinicializar um VFD com falha. A tela pode ser selecionada a partir da tela *Limpeza* ou da tela *Operação.* Se o alto torque do transportador provocar uma redução no fluxo da bomba, a mensagem "Redução da Taxa de Fluxo" é exibida na tela *Operação* ou *Limpeza* para informar ao operador que a bomba está operando a uma taxa de fluxo reduzida. Essa mensagem também aparece na tela *Reinicialização de Falhas.* Após a remoção da causa da baixa vazão, RESTAURAR é selecionado na tela *Reinicialização de Falha* para voltar à bomba para a vazão normal. Depois de qualquer falha, certifique-se que a centrífuga parou completamente antes de tentar recomeçar.

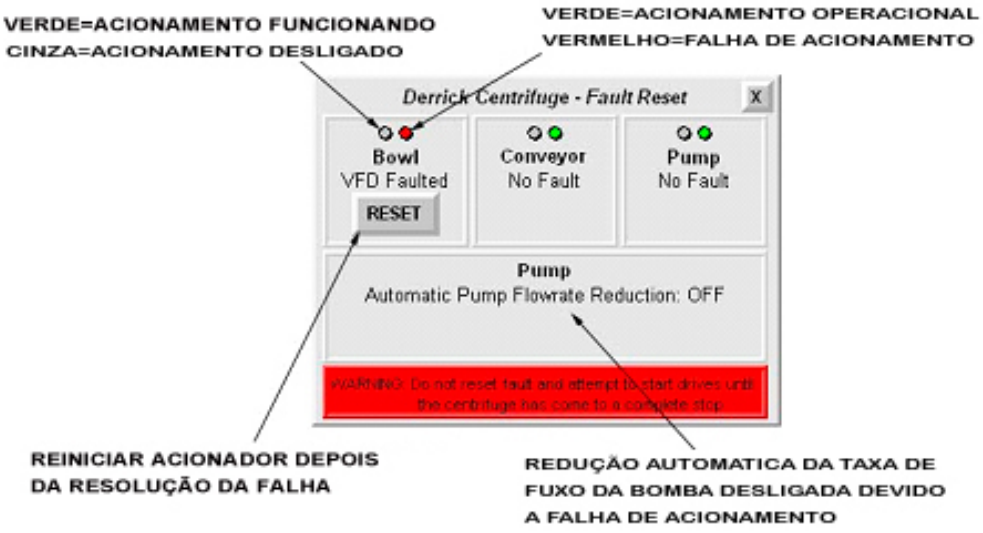


Figura 4-12 Tela Reinicialização de Falha

TELA DE CONFIGURAÇÃO

A tela *Configuração* (Figura 4-13) permite ao operador visualizar a versão do software instalado no PLC e painel de controle (HMI), configurações do recipiente e velocidade diferencial e as características da bomba de alimentação, bem como definir as preferências pessoais. O operador pode ajustar o brilho da tela do painel de controle e selecionar as unidades de temperatura (°C ou °F), que serão exibidas nas outras telas.

Opções são fornecidas para seleção das telas *Login, Diagnósticos,* ou *Inicial.* Se *Login* for selecionado, aparecerá um pedido para inserir um nome de usuário e senha, disponível apenas para pessoal autorizado. Quando a tela for acessada, o pessoal autorizado pode definir ou alterar parâmetros do recipiente, transportador e VFD das bombas.

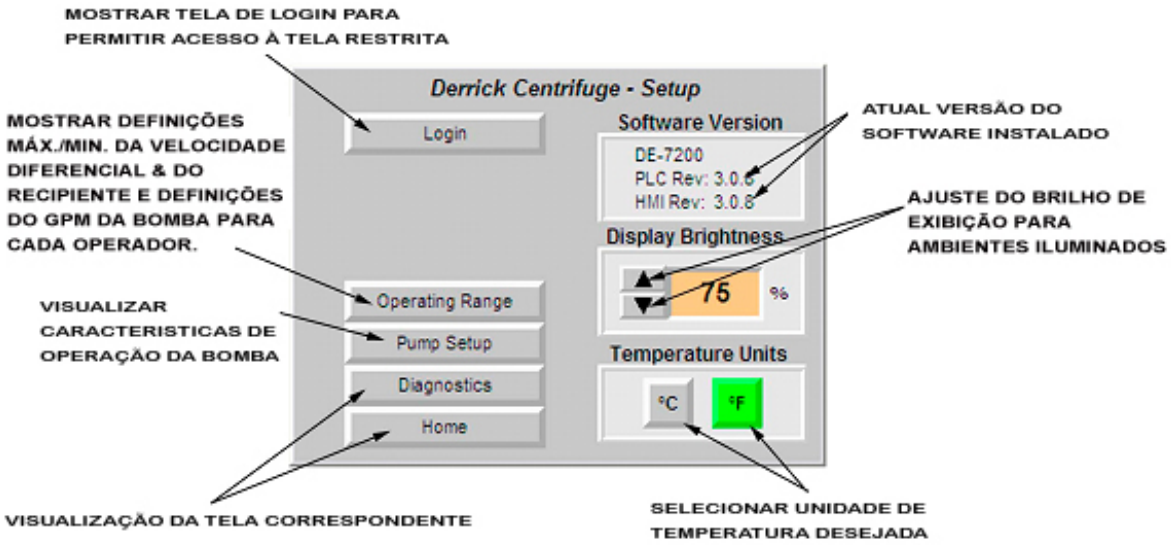


Figura 4-13 Tela de Configuração

TELA DE CONFIGURAÇÃO DA BOMBA

As características de funcionamento da bomba são visualizadas na tela de *Configuração da Bomba* (Figura 4-14). Informações digitadas das especificações de funcionamento da bomba e motor de acionamento são exibidas para mostrar ao operador informações atuais do motor e da bomba.

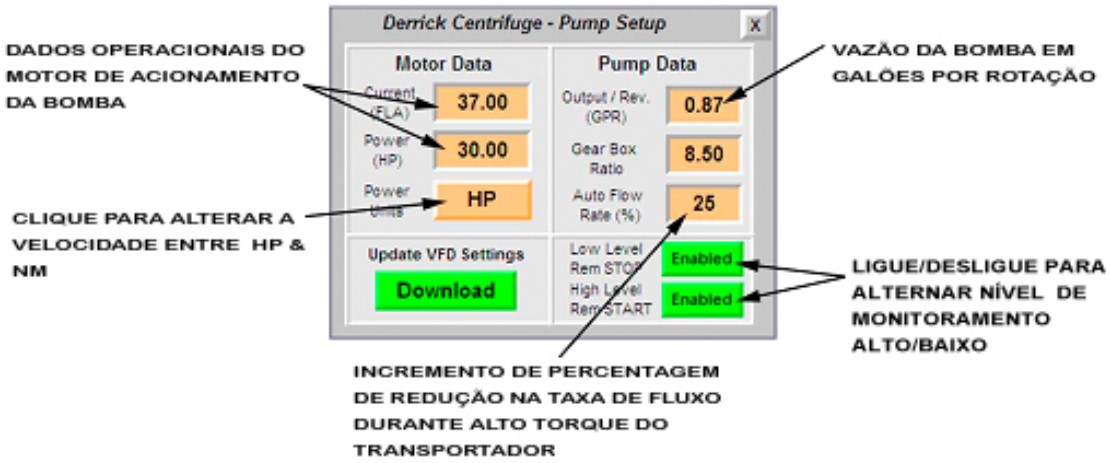


Figura 4-14 Tela de Configuração da Bomba

LOGIN

A tela de *Login* (Figura 4-15) é acessada a partir da tela de *Configuração* (Figura 4-13). Ela permite que o pessoal autorizado digite uma senha necessária para mostrar telas restritas. Essas telas permitem ao pessoal de supervisão reconfigurar características operacionais e os parâmetros que controlam a operação da centrífuga.

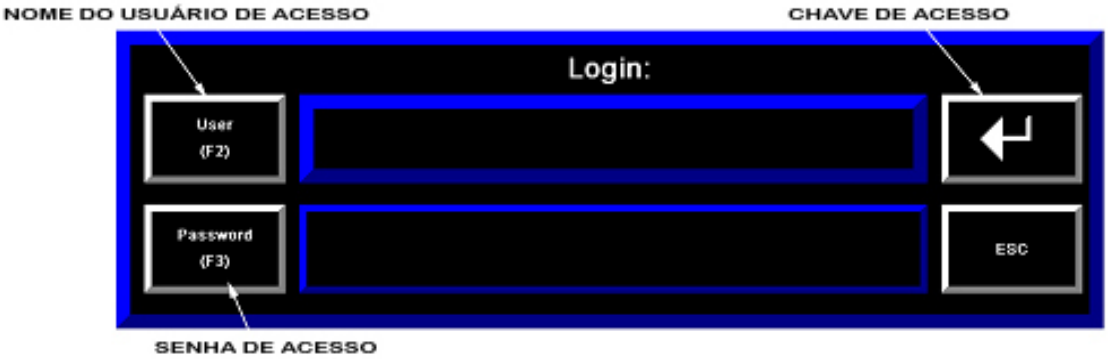


Figura 4-15 Tela de Login

LIMPEZA

A tela Limpeza (Figura 4-16) é usada para definir parâmetros para operar o recipiente e/ou transportador para remover o material processado acumulado que está impedindo a rotação. Com esta tela em exibição, o operador seleciona o RPM desejado para o processo de limpeza do recipiente e transportador. Durante a limpeza, os percentuais reais de RPMs e torque são exibidos abaixo dos pontos definidos. Provisões são incluídas para selecionar as opções de limpeza automática ou manual.

Quando o processo de limpeza expirar ou for interrompido pelo operador, a tela *Operação* ou a tela *Falhas* podem ser exibidas.

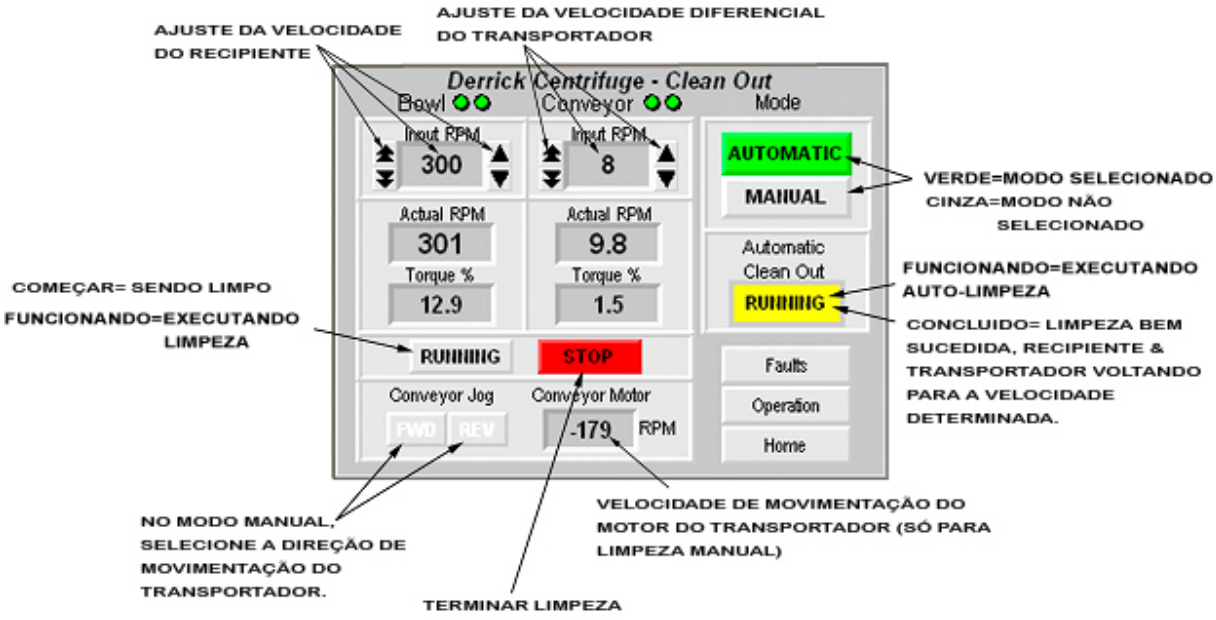


Figura 4-16 Tela de Limpeza

Se a redução automática da velocidade da bomba é incapaz de limpar sólidos provenientes do transportador, o torque vai continuar a subir e a centrífuga será desligada. O procedimento de limpeza deve então ser usado para limpar os sólidos comprimidos e retornar a centrífuga para o status de operacional. Os parágrafos seguintes explicam as duas opções de limpeza: automática e manual.

Limpeza Automática

Quando a opção automática é selecionada, o sistema irá realizar um ciclo de limpeza por um período pré-estabelecido. O recipiente funciona a 300 RPM para à frente, enquanto o transportador opera em uma velocidade que varia de 8-30 RPM para à frente. Se resistência excessiva for encontrada durante a limpeza, o sistema fará uma pausa e alertará o operador que a limpeza automática foi incapaz de limpar a centrífuga. A intervenção do operador é então necessária para repetir a operação de limpeza automática.

Limpeza Manual

Se a opção limpeza manual for selecionada, o operador pode escolher movimentar o transportador para frente e para trás, com o recipiente configurado a zero RPM. Se desejar, no entanto, o operador pode escolher operar o recipiente bem como o transportador. A rotação inversa do transportador é regida por um temporizador que termina a operação reversa após um intervalo pré-definido. O objetivo principal do modo de limpeza manual é permitir movimentar o transportador em um esforço para remover o material compactado.

DESLIGAMENTO NORMAL

O procedimento de desligamento normal deve ser usado para uma parada de operação controlada. O desligamento normal é executado para as atividades de rotina, tais como a limpeza, lubrificação, inspeção ou ajuste.

Note! Desligamento e descarga adequados do recipiente podem impedir alta vibração na inicialização seguinte.

DESLIGAMENTO NORMAL	
Passo	**Procedimento**
1	Parar a bomba de alimentação.
2	Inicialmente continuar o fornecimento de água fresca de descarga para remover todos os resíduos sólidos provenientes do transportador e do recipiente. Continue lavando de 3 a 5 minutos após a bomba de alimentação ser desligada. Independente do período de desligamento, o transportador opera com um diferencial de velocidade pré-definido enquanto o recipiente desacelera até parar. Este processo limpa o recipiente durante o desligamento. A força centrífuga força o líquido de descarga contra a parede do recipiente durante o processo de descarga. À medida que a velocidade cai gradualmente durante o período de desligamento, a calha de sólidos também pode ser descarregada. Conexões no lado da dobradiça do invólucro permitem a ligação de uma mangueira para lavar o exterior do conjunto rotativo e interior do conjunto do invólucro.
3	Motor de acionamento da caixa de velocidades é desligado automaticamente quando a velocidade do recipiente cai para menos de 200 RPM.
4	Após a paralisação da centrífuga (que pode demorar mais de 10 minutos após a interrupção de energia para o motor do recipiente), a centrífuga deve ser reiniciada por 20 a 30 segundos para limpar os sólidos liberados durante o colapso da água-anel.
5	Execute o procedimento de limpeza automática.
6	Desligue o suprimento de energia elétrica da máquina e bloqueie e etiquete (LOTO) a máquina.
7	Para gabinetes com sistema de drenagem, desligue a alimentação de ar comprimido para a Unidade do gabinete de drenagem.

DESLIGAMENTOS AUTOMÁTICOS

A centrífuga foi construída com recursos de segurança para proteger o equipamento. Esses recursos irão resultar em desligamento automático da centrífuga antes que ocorram danos. Os parágrafos seguintes descrevem estes desligamentos automáticos.

Vibração Excessiva

Vibração excessiva da centrífuga ira fazer com que o interruptor de vibração interrompa a energia elétrica para o relé de execução da centrífuga, desligando a máquina. Vibração excessiva como essa pode ocorrer durante a inicialização ou o funcionamento normal devido à queda de um paredão formado pelo bolo ou outra condição desequilibrada do recipiente. A máquina poderá ser reiniciada pressionando o botão restaurar do interruptor de vibração e, em seguida, usando o procedimento de Inicialização normal acima.

Se a máquina continuamente trepidar durante a inicialização normal, lave o recipiente com água fresca durante a execução da limpeza automática de rotina.

Temperaturas do Rolamento Principal

Sensores de temperatura são instalados no rolamento principal das extremidades de líquidos e sólidos, e ligados ao PLC. As temperaturas dos rolamentos são continuamente exibidas na tela *Operação.* Uma mensagem de alarme é exibida no painel de controle quando a temperatura dos rolamentos ultrapassar 225°F (107°C). Se a temperatura subir para 250°F (120°C), uma mensagem de falha aparece e a centrífuga é desligada. Temperaturas de rolamentos excessivamente altas geralmente indicam falha do rolamento, o que pode resultar de lubrificação inadequada ou excessiva, contaminação ou desgaste severo. Consulte a Seção 5 para procedimentos de substituição de rolamento principal.

Velocidade Excessiva do Recipiente

Um sensor que detecta a velocidade de rotação do recipiente apresenta uma entrada para o PLC, que produz uma exibição contínua velocidade real do recipiente nas telas Operação e VFD do Recipiente. Uma mensagem de falha é exibida e a centrífuga é desligada imediatamente se a velocidade subir a 3100 RPM. Para reiniciar a centrífuga, permita que o recipiente pare completamente, verifique e remova a causa do excesso de velocidade, conforme descrito na Seção 5. Depois de corrigir o(s) defeito(s), reiniciar a máquina usando o procedimento normal de inicialização acima, e verificar a velocidade da embreagem novamente.

DESLIGAMENTO DE EMERGÊNCIA

Para parar a centrífuga em caso de emergência, pressione a tecla PARADA DE EMERGÊNCIA no gabinete de controle ou na centrífuga selecione PARAR na tela Operação ou desconecte a energia elétrica para o aparelho.

Pressionar PARADA DE EMERGÊNCIA imediatamente remove a energia do recipiente, transportador, motores e bombas, permitindo ao recipiente parar. Isso pode levar mais de 15 minutos, dependendo velocidade do recipiente e quantidade de material dentro do recipiente. Para parar o recipiente mais rápido, pressione o botão PARAR na tela Operação ou exiba a tela do VFD do Recipiente e pressione o botão RECIPIENTE ESTÁ PARANDO. No entanto, antes de pressionar este botão, todos os alarmes/falhas devem ser apurados.

SEÇÃO 5 - MANUTENÇÃO

GERAL

Esta seção descreve os procedimentos preventivos e de manutenção corretiva da centrífuga DE-1000 VFD. Procedimentos óbvios foram omitidos. Antes de inicializar qualquer manutenção da centrífuga, desligar, bloquear (LO), e etiquetar (TO) o equipamento.

	ATENÇÃO! ALTA TENSÃO PODE ESTAR PRESENTE. SEMPRE ABRA O FUSÍVEL QUE DESCONECTA O FORNECIMENTO DE ELETRICIDADE AO EQUIPAMENTO, E FECHE E DESLIGUE O SUPRIMENTO DE ENERGIA ANTES DE EXECUTAR QUALQUER PROCEDIMENTO DE MANUTENÇÃO.
	ATENÇÃO! A FALHA NO USO DE ÓCULOS DE SEGURANÇA PODE RESULTAR EM LESÃO SÉRIA NO OLHO OU PERDA PERMANENTE DA VISÃO. OS ÓCULOS DE SEGURANÇA DEVEM SER USADOS SEMPRE QUE QUALQUER PROCEDIMENTO DE MANUTENÇÃO FOR EXECUTADO.

MANUTENÇÃO PREVENTIVA

A manutenção preventiva consiste em inspeção, limpeza e lubrificação. Estes procedimentos de rotina vão garantir máxima vida útil e operação livre de problemas. Enquanto a programação de manutenção apresentada nesta seção deve ser flexível, as modificações devem ser baseadas na experiência de operação do equipamento em suas instalações. Um registo de manutenção deve ser mantido para ajudar a estabelecer um cronograma de manutenção preventiva, bem como monitorar e ajustar o cronograma conforme necessário durante a vida útil do equipamento.

Considere os seguintes fatores ao estabelecer um cronograma de manutenção preventiva:

- Ciclo de serviço
- Temperatura ambiente
- Ambiente Operacional

O cronograma de manutenção preventiva recomendado é apresentado na tabela abaixo. Consulte a tabela de lubrificação na página seguinte para lubrificantes aplicáveis e as quantidades.

CRONOGRAMA DE MANUTENÇÃO PREVENTIVA	
Ação	**Frequência**
Verifique se há vazamentos nas conexões do tubo de alimentação e aperte os grampos das conexões conforme necessário.	Cada turno
Inspecione se há vazamentos nas conexões de descarga de líquidos. Aperte a ligação e/ou adicione silicone selante para evitar vazamentos.	Cada turno
Engraxe os rolamentos do conjunto rotativo (Figura 5-1).	Uma tiragem por turno
Remova o tubo de alimentação, limpe o interior do tubo, e reinstale.	Semanal

MANUTENÇÃO PREVENTIVA (CONT.)

PROGRAMAÇÃO DE MANUTENÇÃO PREVENTIVA	
Ação	**Frequência**
Verifique o nível de fluido da caixa de engrenagem com o dispositivo de recarga na posição 12 horas.	A cada 2 semanas
Verifique as partes interiores e exteriores do gabinete procurando por sólidos acumulados e limpe se necessário.	Semanalmente
Limpe com descarga de água os rolamentos do transportador.	A cada 2 semanas
Remova a cobertura da correia, examine a correia para danos, e verifique/ajuste a tensão.	Mensalmente
Remova e limpar as tampas do defletor.	Mensalmente

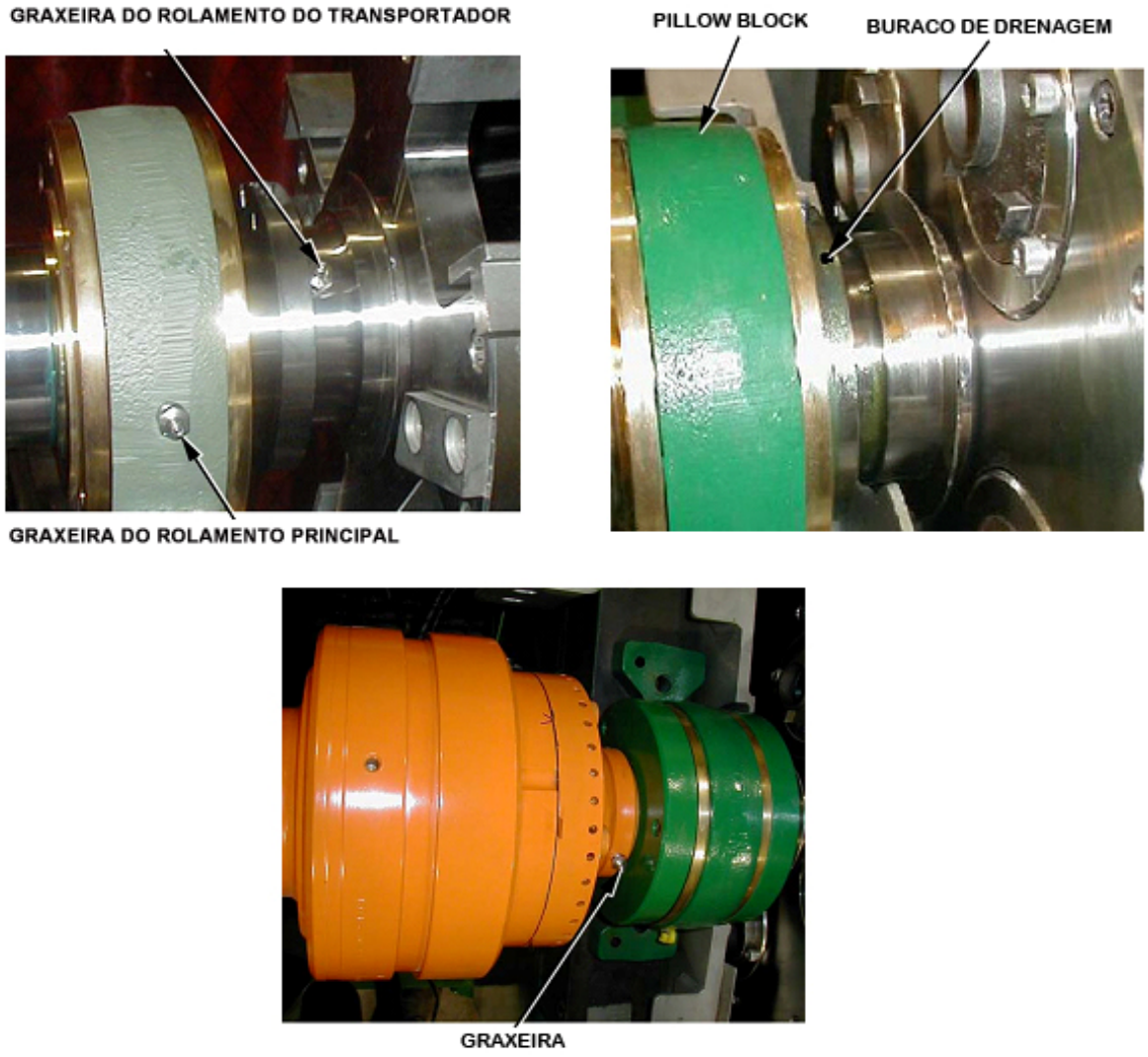


Figura 5-1 Pontos de Lubrificação do Conjunto Rotativo

GRÁFICO DE LUBRIFICAÇÃO

A tabela a seguir lista os lubrificantes Derrick aprovados para a centrífuga DE-1000 VFD.

LUBRIFICANTES DERRICK APROVADOS - CENTRÍFUGA DE-1000 VFD				
Fabricante	**Produto**	**Uso**	**Quantidade**	**Temp**
ÓLEOS				
Texaco	Meropa 320	Caixa de Engrenagem	80 Oz.	Padrão
Mobil	SHC 220	Caixa de Engrenagem	80 Oz.	Ártico
GRAXAS				
Chevron	SRI NLGI 2 SRI-2	Rolamentos Principais & do transportador	A/R	Padrão
Shell	Aeroshell 14	Rolamentos Principais & do transportador	A/R	Ártico
Centrilube	1000 (Nyogel 760D)	Só Rolamentos Principais	A/R	4000 RPM
Mobil	FM 102 (Grau Alimentício)	Só rolamentos do Transportador	A/R	Padrão

MANUTENÇÃO DE COMPONENTE

Os parágrafos a seguir descrevem os procedimentos de manutenção para os componentes da centrífuga e conjuntos. Procedimentos óbvios foram omitidos. Antes de inicializar qualquer centrífuga, desligar, bloquear (LO), e etiquetar (TO) o equipamento.

ATENÇÃO! ALTA TENSÃO PODE ESTAR PRESENTE. SEMPRE ABRA O FUSÍVEL QUE DESCONECTA O FORNECIMENTO DE ELETRICIDADE AO EQUIPAMENTO, E BLOQUEI E ETIQUETE (LOTO) O SUPRIMENTO DE ENERGIA ANTES DE EXECUTAR QUALQUER PROCEDIMENTO DE MANUTENÇÃO.

ATENÇÃO! A FALHA NO USO DE ÓCULOS DE SEGURANÇA PODE RESULTAR EM LESÃO SÉRIA NO OLHO OU PERDA PERMANENTE DA VISÃO. OS ÓCULOS DE SEGURANÇA DEVEM SER USADOS SEMPRE QUE QUALQUER PROCEDIMENTO DE MANUTENÇÃO FOR EXECUTADO.

Correia Motriz

A correia motriz deve ser substituída se a inspeção revelar danos ou deterioração. Para substituir a correia, faça o seguinte:

1. Folgue os parafusos que fixam a braçadeira do tubo de alimentação e deslize o tubo de alimentação para fora.
2. Solte as travas e remova a proteção da correia que cobri as polias e acoplamento de fluidos.

3. Folgue/solte as porcas de travamento que prendem os pés do motor de acionamento do recipiente à base (Figura 5-2), gire os parafusos de ajuste no sentido anti-horário para afrouxar a correia e então remova a correia das roldanas.

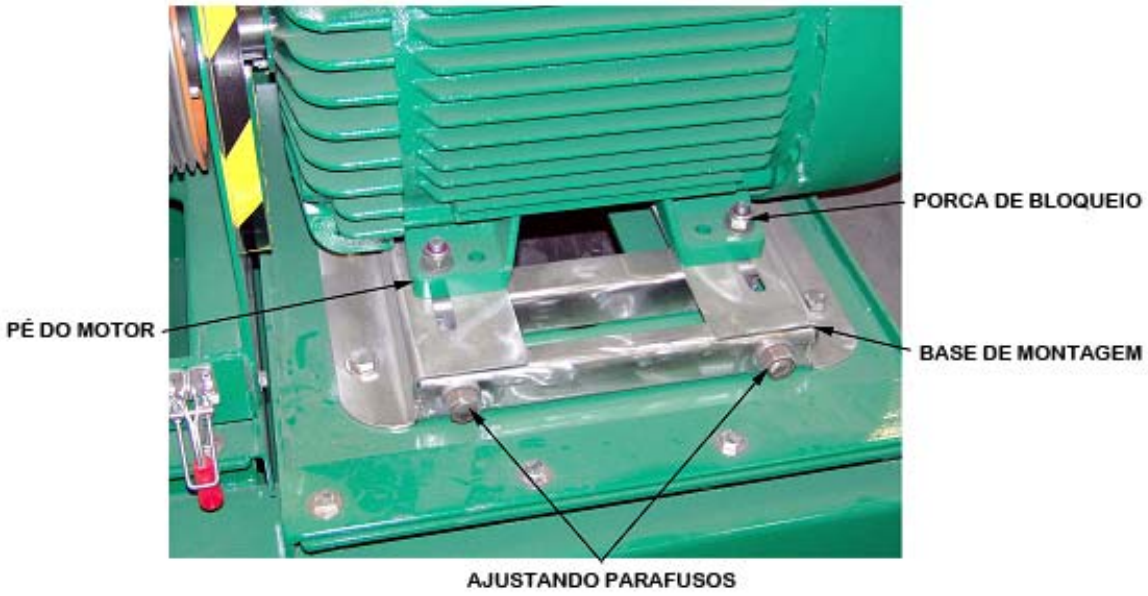


Figura 5-2 Tencionamento da Correia Motriz

4. Verifique o alinhamento paralelo das polias utilizando a extremidade reta. Ajuste a(s) posição(ões) da(s) polia(s) para atingir um alinhamento paralelo de aproximadamente 0,0156 polegadas.
5. Instale uma nova correia no motor de acionamento e nas polias do conjunto do recipiente.
6. Aperte os parafusos de ajuste da montagem do motor para aplicar tensão à correia suficiente para permitir uma deformação de 5/8” com 20 lb de pressão exercida no ponto médio da correia. Depois da tensão correta ser definida, aperte os parafusos de montagem do motor.
7. Instale a proteção das correias e trave no lugar.
8. Insira os tubos de alimentação no apoio de tubo de alimentação até o ombro entrar em contato completamente com o apoio e aperte os parafusos até a especificação listada em *Especificações de Torque de Materiais* nesta seção.

MANUTENÇÃO DO CONJUNTO ROTATIVO

A manutenção do conjunto rotativo requer desmontagem e só pode ser realizada com o conjunto fora do invólucro. Após a remoção de dentro do invólucro, o conjunto rotativo é orientado com a extremidade de sólidos para baixo e colocado na plataforma de apoio para facilitar a remoção da extremidade superior do recipiente de líquidos e transportador. Os parágrafos a seguir descrevem os procedimentos de manutenção para o conjunto rotativo.

Remoção e Desmontagem

1. Desligue, bloqueie (LO) e etiquete (TO) energia elétrica para a centrífuga.

ATENÇÃO! SEMPRE PERMITA QUE A MÁQUINA DESACELERE ATÉ UMA PARADA COMPLETA ANTES DE ABRIR A TAMPA OU REMOVER OS PROTETORES.

2. Após o conjunto do recipiente ter parado completamente, folgue os parafusos que fixam a tampa do invólucro até que os parafusos se soltem do invólucro inferior e levante a tampa.
3. Retire o tubo de alimentação e a correia motriz.
4. Remova a tampa superior do gabinete da caixa de engrenagem.
5. Coloque uma correia de elevação apropriada e eleve para o motor de acionamento do transportador.
6. Remova os parafusos que fixam as duas metades do acoplamento flexível aos eixos do motor e caixa de engrenagem do acionamento do transportador e retire as metades do acoplamento (Figura 5-3).
7. Remova as porcas e arruelas que predem o motor de acionamento do transportador à base de montagem, levante e remova o motor.
8. Retire a caixa de engrenagem do seguinte modo:
   a. Remova seis parafusos que fixam a caixa de engrenagem (Figura 5-4) à flange.
   b. Instale dois parafusos jack de 3/8"-16 nos orifícios com folga do flange da caixa de engrenagem e alternadamente gire os dois parafusos jack algumas voltas por vez para começar a separar a caixa de engrenagem do flange.
   c. Apoie a caixa de engrenagem durante o restante do procedimento usando uma correia de elevação e um guincho apropriado.
   d. Separe completamente a caixa de engrenagem do flange folgando alternadamente os parafusos jack até a unidade se soltar totalmente.
   e. Com a caixa de engrenagem apoiado pela cinta de levantamento e pelo dispositivo de levantamento, **CUIDADOSAMENTE** deslize a caixa de engrenagem para fora até que esteja solta do eixo estriado. Coloque a caixa de engrenagem em um saco plástico para evitar contaminação.

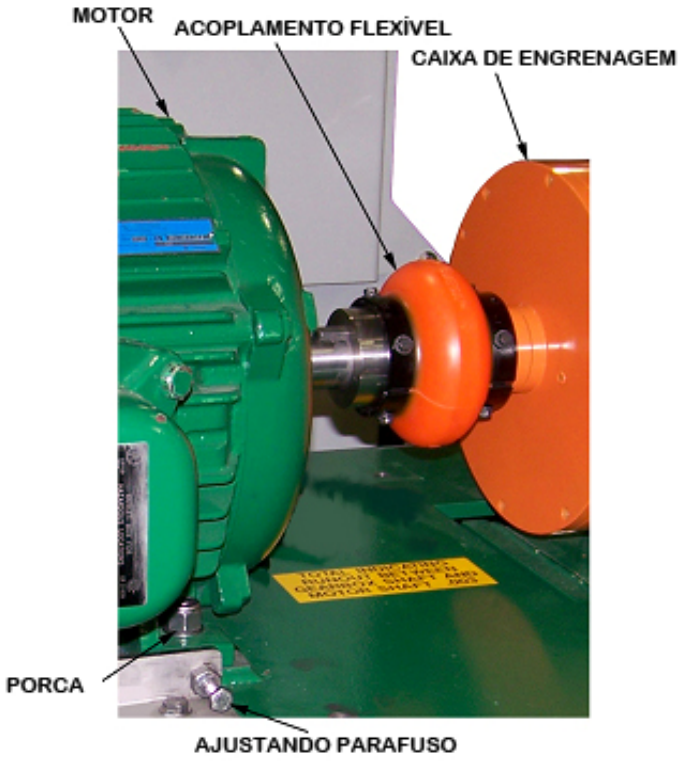


Figura 5-3 Acoplamento do acionador do Transportador

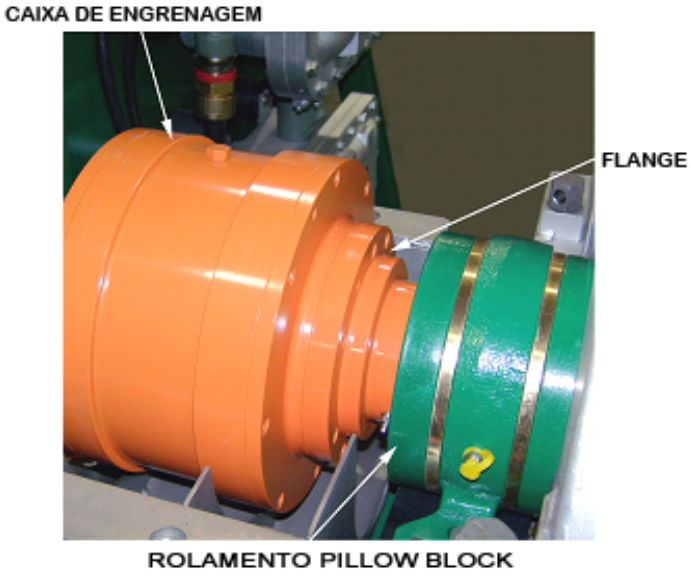


Figura 5-4 Remoção da Caixa de Engrenagem

9. Aperte as porcas dos pinos de alinhamento do pillow block para forçar os pinos para fora e remova os pinos.
10. Remova os parafusos que fixam os pillow blocks às almofadas da montagem da base.

11. Anexe cintas de elevação em dois locais no conjunto rotativo e utilize um guindaste capaz de suportar aproximadamente 2000 libras, eleve e remova o conjunto rotativo do invólucro.
12. Marque a localização de todos os calços encontrados entre os pillow blocks e as almofadas de montagem da base e retenha os calços.
13. Aplique um revestimento protetor nas superfícies de acoplagem dos pillow blocks e base.
14. Retire o conjunto da parte superior do recipiente de líquidos do seguinte modo:
    a. Erga e oriente o conjunto rotativo verticalmente com a extremidade de sólidos para baixo e insera a extremidade no slot de apoio vertical (Figura 5-5) enquanto continua a apoiar o peso com o guindaste.
    b. Registre a localização das marcas de alinhamento na parte superior do recipiente de líquidos para garantir orientação adequada durante a remontagem.
    c. Remova 12 parafusos (Figura 5-6) que fixam a parte superior do recipiente de líquidos ao conjunto do recipiente.
    d. Alinhe quatro parafusos jack em quatro orifícios enroscados de parafuso jack na parte superior do recipiente e aperte uniformemente até que a parte superior se separe do recipiente.
    e. Conecte um segundo guindaste ao flange da parte superior do recipiente de líquidos e comece a levantar a parte superior do recipiente para fora do recipiente com o pillow block e o eixo estriado conectados. Se a parte superior do recipiente não se separar do conjunto rotativo completamente, abaixe a parte superior até que haja o mínimo espaço suficiente para inserir uma barra de alavanca. Cuidadosamente force a parte superior do recipiente até que este se solto do recipiente, então erga e remova a parte superior do recipiente. Remova e descarte o anel em O da parte superior do recipiente.

Figura 5-5 Colocação da Extremidade de Sólidos do Conjunto Rotativo no Apoio Vertical

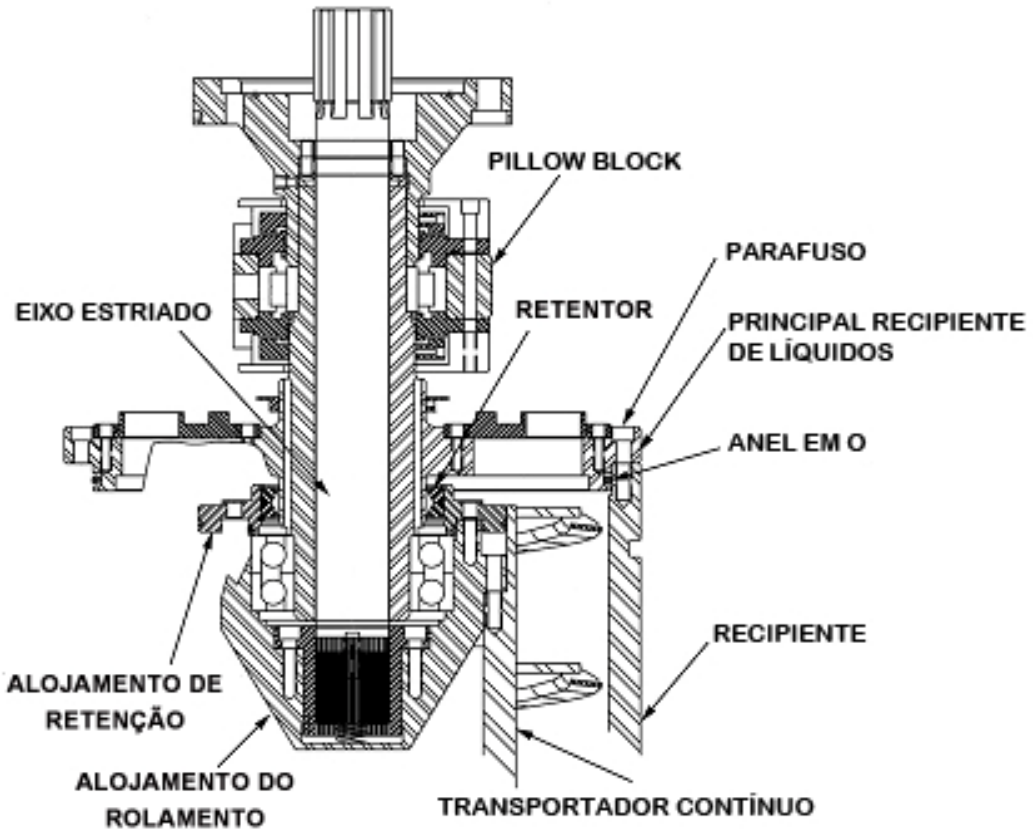


Figura 5-6 Remoção da Parte Superior do Recipiente de Líquidos

15. Retire o conjunto do transportador do seguinte modo:

    a. Retire quatro parafusos que fixam o alojamento do retentor da extremidade de líquidos ao transportador e, utilizando parafusos jack separe o alojamento do retentor do alojamento de rolamento, remova o alojamento de retenção. Descarte o retentor.

    b. Posicione o suporte de elevação vertical no transportador (Figura 5-7), e fixe com quatro parafusos.

    c. Conecte um guindaste capaz de levantar pelo menos 750 libras ao suporte de elevação vertical.

    d. Levante lentamente o transportador separando-o do conjunto do recipiente, tomando cuidado em evitar que o transportador entre em contato com o interior do recipiente.

    e. Oriente o transportador horizontalmente e coloque-o sobre um apoio que não entre em contato com os ladrilhos.

Remoção e Desmontagem (Cont.)

Figura 5-7 Conectando Suporte de Elevação Vertical ao Transportador

Limpeza, Inspeção e Reparo.

Depois de retirar e desmontar o conjunto rotativo, limpe, inspecione e concerte da seguinte forma:

1. Lave e remova a lama/pasta e os detritos do transportador e as partes interiores e exteriores do conjunto do recipiente.
2. Inspecione o transportador em busca de ladrilhos faltando, correias distorcidas ou arrancadas, rebarbas ou outros danos visíveis. Substitua o transportador se defeitos graves forem encontrados.
3. Inspecione bocais de alimentação do transportador em busca de desgaste evidente. Gire 180 graus e reinstale se o dano for visível, mas não grave. Substitua os bocais se estiverem muito danificados. Para ajudar a preservar o equilíbrio dinâmico, sempre substitua os bocais em pares que sejam opostos.
4. Inspecione o acelerador de alimentação dentro do transportador em busca de ranhuras, fraturas ou distorção. Se a substituição for necessária, remova três parafusos de ajuste que fixam o acelerador de alimentação e dê uma bata leve na extremidade de sólidos para remover o acelerador.
5. Inspecione as inserções desgastáveis da descarga de sólidos no conjunto do recipiente em busca de rachaduras, fraturas ou outros danos e substitua se seriamente danificados.
6. Inspecione o interior e o exterior do recipiente em busca de ranhuras, arranhões ou outros danos que possam afetar o desempenho.
7. Verifique nos rolamentos pillow block e nos rolamentos do transportador se há soltura, ruído ou atrito. Substitua todos os rolamentos defeituosos, de acordo com *Substituição de Rolamentos* nesta seção.

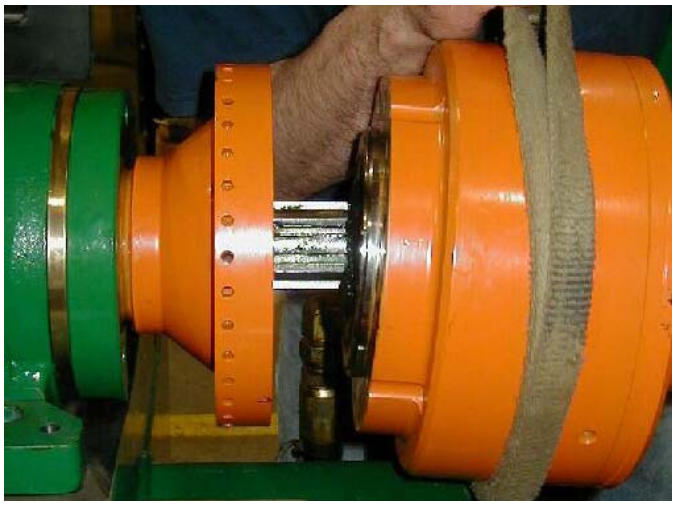
Remontagem e Instalação

A remontagem e instalação do conjunto rotativo são basicamente o inverso da remoção. Faça o seguinte para remontar e instalar o conjunto rotativo:

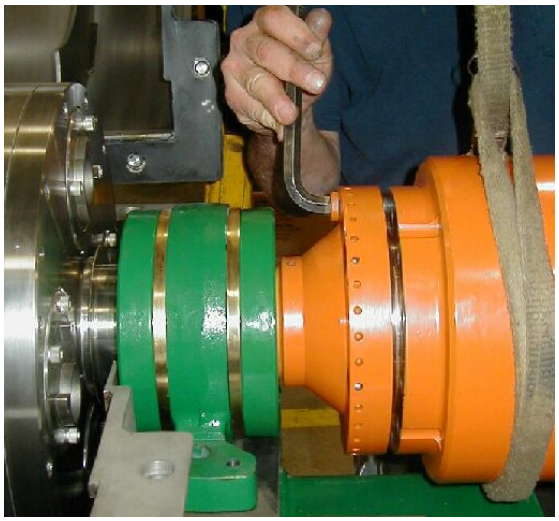
1. Concerte e instale o transportador no conjunto do recipiente do seguinte modo:
   a. Aplique uma leve camada de graxa ao assento do rolamento e sele as superfícies do transportador para facilitar a instalação.
   b. Com o recipiente na posição vertical no suporte vertical, eleve o transportador acima do recipiente e cuidadosamente abaixe para dentro do recipiente.
   c. Remova o suporte de elevação vertical do transportador.
   d. Instale o novo retentor no alojamento de retenção (Figura 5-6), aplique uma leve camada de graxa para vedar e instale o alojamento de retenção sobre o alojamento de rolamento. Aplique um composto antiaderente nos parafusos, insira os parafusos através dos orifícios do alojamento de retenção e aperte para dentro do alojamento de rolamento em conformidade com Especificações de Torque das ferragens nesta seção.
2. Instale o novo anel em O na ranhura da parte superior do recipiente de líquidos, aplique uma leve camada de graxa no anel em O e instale a parte superior do recipiente de líquidos no recipiente. Oriente a parte superior do recipiente de modo que as marcas de alinhamento combinem, e prenda a parte superior do recipiente de líquidos ao recipiente com parafusos. Aperte os parafusos de acordo com as Especificações do Torque das ferragens nesta seção.
3. Remova todos os entalhes e/ou rebarbas dos pollow blocks e superfícies correspondentes. Limpe todas as superfícies de qualquer camada protetora aplicada após a remoção.
4. Reinstale calços em locais apropriados, como foi observado durante a remoção.
5. Limpe os pinos de alinhamento antes de reinstala-los, e aplique um composto antiaderente.
6. Direcione o conjunto rotativo para a posição horizontal, e cuidadosamente abaixe-o para dentro do invólucro até cerca de 1/2" acima da base.
7. Insira os parafusos através dos pillow blocks, e comece a enroscar-los na base. Não aperte os parafusos.
8. Conjunto de rolagem baixa totalmente na base.
9. Insira pinos de alinhamento através dos pillow blocks, e bata levemente para dentro dos buracos a fim de alinhar totalmente os pillow blocks com os buracos da base de montagem.
10. Aperte os parafusos de acordo com as especificações referente em Especificações de *Torque das ferragens* nesta seção, para prender os pillow blocks à base.

Remontagem e Instalação (Cont.)

11. Instale a caixa de engrenagem da seguinte forma:



11a - Inserir o novo anel em O na ranhura virada para o Rotodiff, e aplique graxa no eixo para facilitar a instalação. Coloque a cinta de elevação no Rotodiff e, usando um dispositivo de levantamento de carga **CUIDADOSAMENTE** suspenda o Rotodiff para engatar o eixo estriado com as ranhuras internas do Rotodiff.



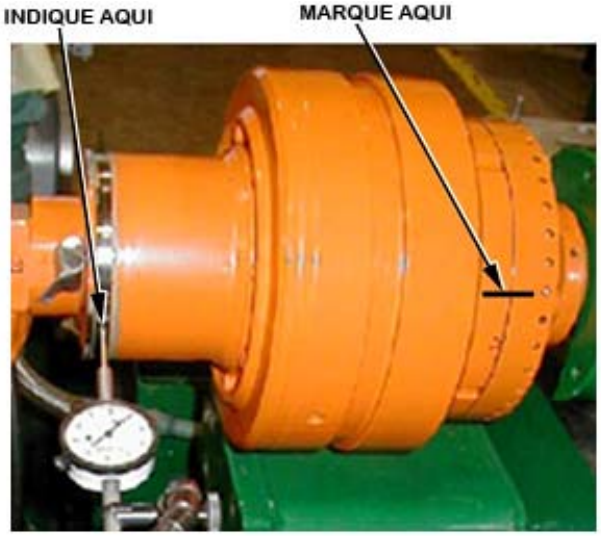
11b. - Coloque seis novos parafusos de cabeça sextavada através do flange do Rotodiff e para dentro dos buracos de montagem roscados do Rotodiff. Alternadamente gire cada parafuso algumas voltas por vez para uniformemente juntar a caixa de engrenagem e o flange.

Aperte os parafusos de montagem usando um padrão de estrela típico para modelos de parafuso circular. Consulte *Especificações de Torque das ferragens* nesta seção para os valores de torque.

12. Injetar graxa nos rolamentos do transportador até escapar graxa do furo de drenagem localizado entre o pillow block e a parte superior do recipiente de líquido. Limpe a graxa excedente e distribua graxa pela parte superior do recipiente liquido rotativo em uma rotação no sentido horário e depois uma rotação no sentido anti-horário.

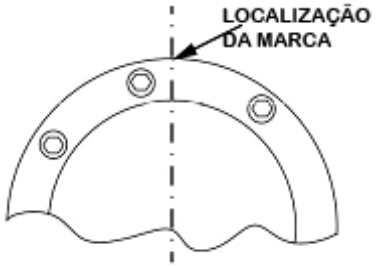
13. Verifique e ajuste o desvio externo da caixa de engrenagem como descrito nas etapas abaixo. O desvio axial não poderá exceder a leitura total do indicador (TIR) de 0.002". Para medir e ajustar o desvio, faça o seguinte:

a. Limpe a superfície da caixa de engrenagem onde a ponta de contato do relógio comparador fará contato.
b. Instale o suporte com base magnética do relógio comparador em qualquer posição indicada.
c. Posicione a ponta de contato do relógio comparador em contacto com o diâmetro externo na linha-central horizontal da caixa de engrenagem.
d. Gire manualmente a caixa de engrenagem até que o relógio comparador esteja na sua leitura mais baixa, e zere o relógio comparador.



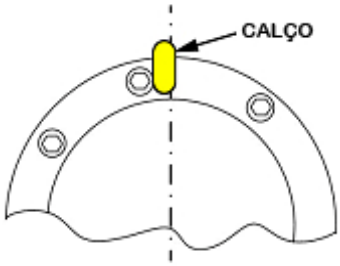
e. Gire manualmente a caixa de engrenagem até que a leitura do relógio comparador fique maior; marque através da caixa de engrenagem e flange ao longo da linha central axial onde as superfícies se unem.

Remontagem e Instalação (Cont.)



f. Gire manualmente a caixa de engrenagem até a marca feita na etapa "e" esteja no topo.

g. Soltar o parafuso de cabeça sextavada mais próximo da marca, assim como aos dois parafusos de cada lado da marca.



h. Insira o calço que tenha a espessura aproximada da medição do relógio comparador entre o flange e a caixa de engrenagem. O calço deve apenas fazer contato com a rosca do buraco do parafuso mais próximo da marca feita na etapa "e".

i. Apertar os parafusos afrouxados na etapa "g".

j. Se necessário, repita as etapas "d" até "i" até o TIR não exceder 0.002".

k. Recorte o excesso do calço.

14. Após concluir a instalação da caixa de engrenagem, instale as tampas superiores sobre a caixa de engrenagem.

15. Instale a correia motriz, e aplique a tensão adequada para evitar derrapagens.

16. Instale o tubo de alimentação e o prenda em seu suporte.

17. Feche a tampa e a prenda com parafusos apertados.

SUBSTITUIÇÃO DO ROLAMENTO PRINCIPAL

Este procedimento descreve a substituição dos rolamentos principais instalados nos pillow blocks. Consulte *Ferramentas e Equipamentos* nesta seção para as ferramentas utilizadas na remoção e os procedimentos de instalação. Vibração ou ruído excessivo durante o funcionamento da centrifuga pode indicar rolamentos defeituosos. Se essas condições são evidentes, os rolamentos devem ser inspecionados a procura de folgas e substituídos se necessário. A substituição do rolamento deve ser realizada por pessoal devidamente treinado e qualificado. Para evitar a contaminação dos rolamentos novos e componentes internos da centrífuga, o procedimento de substituição deve ser realizado em um ambiente limpo.

As extremidades do conjunto rotativo são apoiadas por rolamentos de rolete montados dentro dos pillow blocks. Componentes em cada lado do pillow block formam uma cavidade de graxa em labirinto, que impede a entrada de contaminantes. O rolamento de rolete tem um trilho interno separado que deve ser removido do eixo da parte superior do recipiente após a remoção do rolamento.

Os rolamentos do pillow block devem ser substituídos como um conjunto. Consequentemente, se um rolamento estiver com defeito, troque sempre os dois rolamentos.

Substituição do Rolamento Principal

Qualquer rolamento pode ser removido primeiro. No procedimento a seguir, no entanto, o rolamento do pillow block da extremidade de líquidos é removido em primeiro lugar, seguido pela remoção do rolamento da extremidade de sólidos. Se qualquer um dos rolamentos apresentar defeitos, ambos devem ser substituídos como um conjunto.

Rolamento da Extremidade de Líquidos

Para remover o rolamento da extremidade de líquidos, faça o seguinte:

ATENÇÃO! PARA EVITAR SÉRIAS LESÕES FISICAS CERTIFIQUI-SE DE QUE O EQUIPAMENTO ESTÁ BLOQUEADO E ETIQUETADO (LOTO), DESENERGISADO, E TENHA PARADO DE GIRAR ANTES DE EXECUTAR AJUSTES E/OU MANUTENÇÃO.

Rolamento da Extremidade de Liquido (Cont.)

1. Desligue, bloqueie (LO) e etiquete (TO) energia elétrica para a centrífuga. Permita ao conjunto rotativo parar completamente.
2. Abra a tampa do invólucro e remova os parafusos que fixam os pillow blocks nas extremidades de líquidos e sólidos ao invólucro.
3. Usando um guindaste adequado, eleve o conjunto rotativo para separar os pillow blocks do fundo do invólucro deixando espaço suficiente para permitir a remoção dos pillow blocks.
4. Remova a caixa de engrenagem da parte superior do recipiente de líquidos (Figura 5-9) da seguinte forma:
   a. Trace uma linha entre a caixa de engrenagem e o flange para garantir o posicionamento correto durante a instalação. Usando uma chave sextavada de 14 mm, remova seis parafusos de fixação da caixa de engrenagem ao flange.
   b. Para assegurar a colocação correta do(s) calço(s), marque a localização do(s) calço(s) entre o flange e a caixa de engrenagem. Instale dois parafusos jack de 3/8"-16 nos orifícios com folga do flange que ficam separados por 180°. Usando um chave estrela 9/16", alternadamente gire os dois parafusos jack algumas voltas por vez para começar a separar a caixa de engrenagem do flange.
   c. Para apoiar a unidade durante o restante do procedimento de remoção, coloque a cinta de levantamento em torno da caixa de engrenagem e prenda a cinta no dispositivo de levantamento. Separe completamente a unidade do flange folgando alternadamente os parafusos jack até a unidade se soltar totalmente.
   d. Com a caixa de engrenagem apoiado pela cinta de levantamento e pelo dispositivo de levantamento, **CUIDADOSAMENTE** deslize a unidade para fora até que esteja solta do eixo estriado. Coloque a caixa de engrenagem em um saco plástico para evitar contaminação.

Passo 4a - Parafusos de Fixação da caixa de engrenagem

Passo 4b - Usando Parafusos Jack para separar a Caixa de Engrenagem do Flange

Passo 4c - Usando uma Eslinga para Apoiar a Caixa de Engrenagem Durante a Remoção

Figura 5-9 Remoção da Caixa de Engrenagem

15. Gire o flange (Figura 5-10) até que grandes orifícios de acesso no flange se alinhem com parafusos de retenção para a tampa do defletor externo. Retire os parafusos que fixam a tampa do defletor externo ao pillow block e levante e remova a tampa do defletor.
16. Retire os parafusos que fixam o flange à parte superior do recipiente de líquidos e solte o parafuso de fixação que prende o flange à parte superior do recipiente de líquidos.

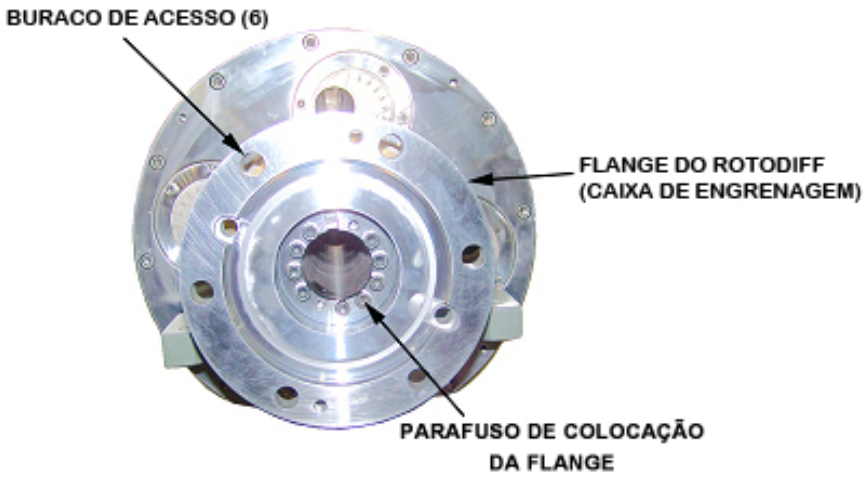


Figura 5-10 Conexão da Caixa de Engrenagem à Flange

17. Enrosque dois parafusos jack no flange e gire alternadamente cada parafuso algumas voltas por vez até o flange for separada da parte superior do recipiente de líquidos, em seguida, segure o flange e puxe da parte superior do recipiente de líquidos.

Note! Defletor externo permanecerá ligado ao flange.

18. Remova os parafusos de cabeça chata segurando a tampa externa do pillow block (Figura 5-11) ao pillow block e retire a tampa. Separe o anel em O da tampa do pillow block e remova o anel em O.
19. Retire os parafusos de cabeça chata que fixam a tampa do pillow block interno ao pillow block e deslize o pillow block (Figura 5-12) e pista externa e os roletes do rolamento da parte superior do recipiente de líquidos.
20. Solte o parafuso de fixação prendendo o defletor interno à parte superior do recipiente de líquidos.
21. Usando um extrator apropriado e cuidado extremo para evitar danos ao apoio ou ombro dos rolamentos na parte superior do recipiente de líquidos, remova a pista interna dos rolamentos da parte superior do recipiente. Descarte a pista interna.
22. Deslize a tampa e o defletor internos do pillow block para fora da parte superior do recipiente. Separe o anel em O da tampa do pillow block e remova o anel em O.
23. Usando um extrator adequado, remova a pista externa e roletes dos rolamentos do pillow block. Descarte a pista externa e roletes.

Rolamento da Extremidade de Liquido (Cont.)

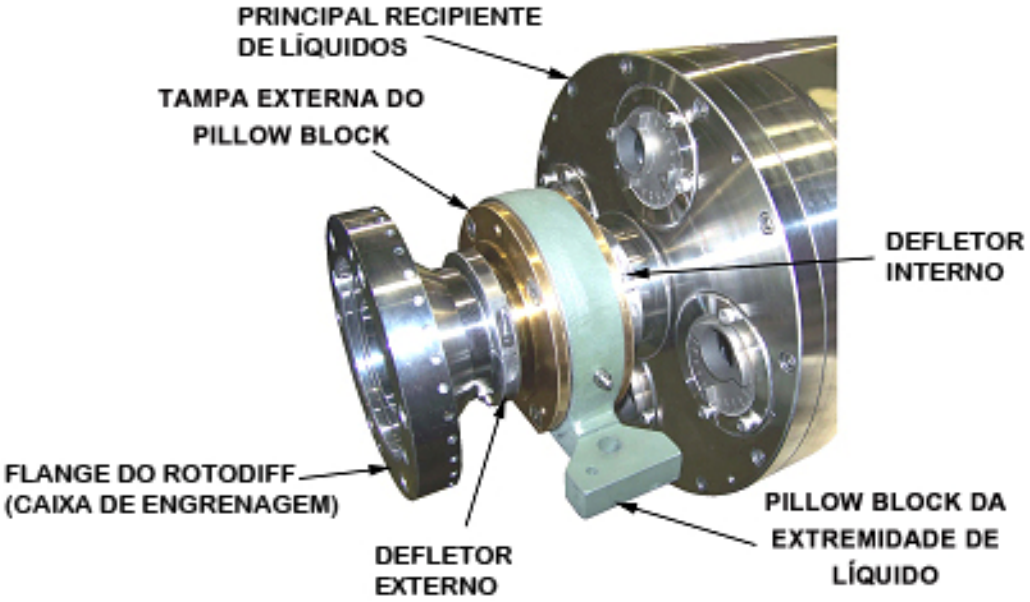


Figura 5-11 Localização do Pillow Block da Extremidade de Líquidos e dos Componentes do alojamento do Rolamento

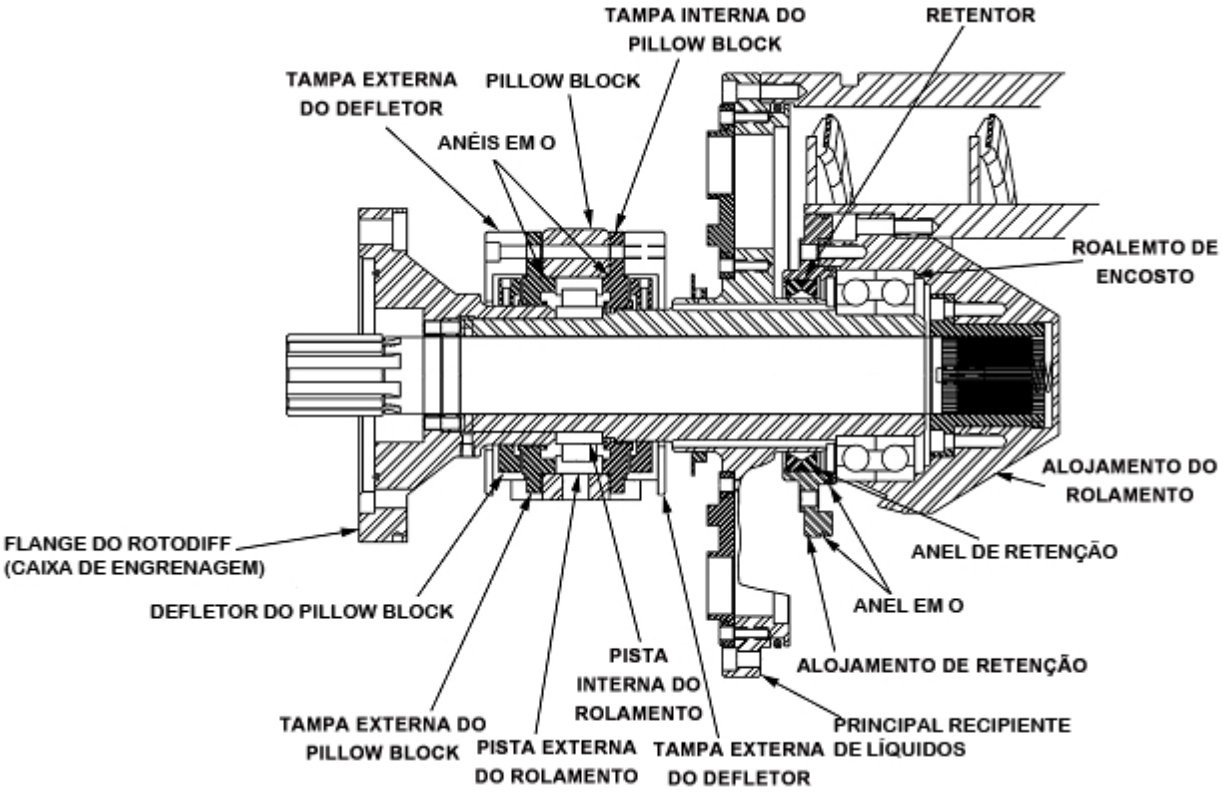


Figura 5-12 Seção Cruzada da Extremidade de Líquidos

Rolamento da Extremidade de Sólidos

Com o rolamento do pillow block da extremidade de líquido previamente removido e conjunto rotativo ainda suspenso, remova o rolamento da extremidade de sólidos (Figura 5-13) como segue:

1. Retire os parafusos fixando as tampas interna e externa do defletor ao pillow block e levante e remova a tampa do defletor interno.
2. Registre marcações de alinhamento na polia e então remova os parafusos que prendem a polia à parte superior do recipiente de sólidos.
3. Enrosque dois parafusos jack na polia e gire alternadamente cada parafuso algumas voltas por vez até a polia ser separada da parte superior do recipiente de sólidos, remova a polia e a tampa do defletor externo.
4. Segure a polia e puxe da parte superior do recipiente de líquidos.

Note! O deflector externo permanecerá preso à polia.

5. Remova os parafusos de cabeça chata que seguram a tampa do pillow block externo ao pillow block e retire a tampa. Separe o anel em O da tampa do pillow block e remova o anel em O.
6. Retire os parafusos de cabeça chata que fixam a tampa interna do pillow block ao pillow block e deslize o pillow block e pista externa e os roletes dos rolamentos da parte superior do recipiente de sólidos.
7. Solte o parafuso de fixação prendendo o defletor interno à parte superior do recipiente de sólidos.
8. Usando um extrator apropriado e cuidado extremo para evitar danos ao apoio ou ombro dos rolamentos na parte superior do recipiente de sólidos, remova a pista interna dos rolamentos da parte superior do recipiente. Descarte a pista interna.
9. Deslize a tampa e o defletor internos do pillow block para fora da parte superior do recipiente. Separe o anel em O da tampa do pillow block e remova o anel em O.
10. Usando um extrator adequado, remova a pista externa e roletes dos rolamentos do pillow block. Descarte a pista externa e roletes.

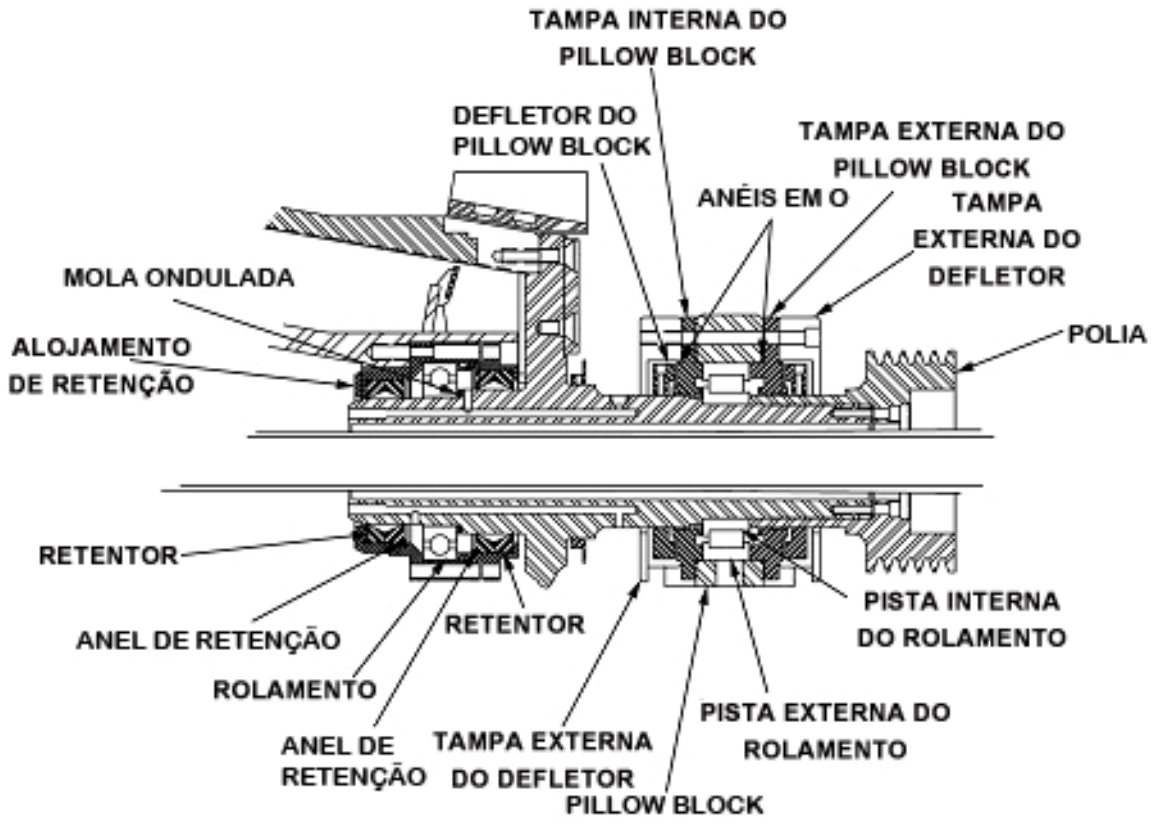


Figura 5-13 Seção Cruzada da Extremidade de Sólidos

Limpeza, Inspeção e Reparo.

1. Limpe todos os componentes com um limpador adequado/desengraxante, e seque com ar comprimido filtrado. Remova qualquer corrosão para facilitar a inspeção.
2. Inspecione a parte superior dos recipientes em busca de arranhões, amassados, rebarbas ou deformações que possam afetar aptidão para retornar ao serviço. Uniformize quaisquer menores defeitos de superfície. Substitua a parte superior do recipiente se o eixo estiver claramente deformado ou falhas graves forem encontradas que impossibilitem a manutenção da parte superior do recipiente.
3. Teste o ajuste de uma nova pista interna de rolamentos nos mancais de rolamento principais de ambas as partes superiores dos recipientes. Se o mancal for pequeno, a pista interna irá deslizar facilmente para o mancal. Substitua a parte superior do recipiente se o mancal for pequeno demais.
4. Inspecione as tampas do pillow block, defletores e tampas de defletores em busca de corrosão, distorção, amassados, rachaduras, rebarbas, fraturas ou outros defeitos. Conserte quaisquer defeitos menores.
5. Substitua qualquer componente que não possa ser facilmente reparado. Substitua todos os O-rings, vedações e rolamentos.
6. Coloque todos os componentes limpos em sacos plásticos para evitar contaminação.

Instalação

O procesimento descreve a instalação do rolamento principal da extremidade de líquidos primeiro, seguido pelo procedimento da extremidade de sólidos. No entanto, qualquer rolamento pode ser instalado primeiro vez em sua respectiva parte superior do recipiente.

Rolamento da Extremidade de Líquidos

ATENÇÃO! NO PASSO A SEGUIR, USE UM AQUECEDOR DE ROLAMENTO OU UM BANHO DE ÓLEO LIMPO AQUECIDO PARA AQUECER A PISTA INTERNA DO ROLAMENTO. NÃO USE UM MAÇARICO POIS ASSIM DANIFICARÁ O ROLAMENTO.

1. Coloque pista interna do rolamento da extremidade de líquidos em um aquecedor de rolamentos ou em um banho de óleo limpo aquecido e aqueça até aproximadamente 230°F (Figura 5-14). Não use um maçarico para aquecer a pista interior pois assim danificará a pista.
2. Usando luvas de isolamento, remova a pista interna aquecida do aquecedor de rolamentos, e logo em seguida deslize no mancal de rolamento até que se encaixe no ombro da parte superior do recipiente. Permita que a pista interna refrigere até ficar imóvel sobre a parte superior do recipiente de líquidos.
3. Deslize o defletor do pillow block interno no eixo, seguido pela tampa do pillow block. Não aperte o parafuso de ajuste do defletor neste momento.
4. Posicione a pista externa do rolamento e roletes no chanfro do pillow block. Usando uma ferramenta adequada que entre em contato apenas a pista externa, cuidadosamente escoste a pista externa no pillow block até aproximadamente 1/8 de polegada abaixo da superfície do pillow block.
5. Instale um novo anel em O no ombro da tampa interna do pillow block e deslize a tampa do pillow block no eixo.
6. Aplique quantidade suficiente da graxa de rolamento listada na especificação do cliente para cobrir completamente os rolamentos de rolete.
7. Deslize o conjunto do pillow block e pista externa do rolamento para a pista interna previamente instalada no rolamento de rolete.
8. Instale um novo anel em O contra o ombro da tampa externa do pillow block, deslize a tampa do pillow block no eixo e apóie no pillow block.
9. Oriente a tampa interna do pillow block de modo que a borda plana esteja alinhada com a parte inferior do pillow block.
10. Aplique um composto antiaderente a quatro parafusos de cabeça chata e instale parafusos para fixar a tampa interna do pillow block ao pillow block. Aperte os parafusos de acordo com as *Especificações do Torque das Ferragens* nesta seção.
11. Oriente a tampa externa do pillow block de modo que a borda plana esteja alinhada com a parte inferior do pillow block.
12. Aplique um composto antiengripante em quatro parafusos de cabeça chata e instale parafusos para fixar a tampa externa do pillow block ao pillow block e puxe o rolamento à

posição adequada dentro do pillow block. Aperte os parafusos de acordo com as *Especificações do Torque das Ferragens* nesta seção.

13. Deslize o defletor externo do rolamento no flange da caixa de engrenagem, mas deixe o parafuso folgado.
14. Aplique uma camada fina de graxa na superfície do eixo do recipiente onde o flange da caixa de engrenagem é montada.
15. Aqueça o flange a 200°F. Durante o manuseio com luvas isoladas, oriente o encaixe do flange com a chave no eixo da parte superior do recipiente de líquidos e instale o flange no eixo. Aperte o parafuso de ajuste para prender o flange.
16. Deslize os defletores de pillow block internos e externos próximo às tampas dos pillow blocks, deixando cerca de 1/16 polegada de espaço livre e aperte os parafusos de ajuste em ambos os defletores.
17. Instale as tampas dos defletores e prenda com parafusos.
18. Usando uma correia de suspensão e um dispositivo de elevação, alinhe a caixa de engrenagem com as linhas rabiscadas durante a remoção e então deslize a caixa de engrenagem no eixo estriado. Insira parafusos através do flange e para dentro do Rotodiff, insira calços de em locais marcados durante a remoção, e aperte os parafusos.

Rolamento da Extremidade de Sólidos

ATENÇÃO! NO PASSO A SEGUIR, USE UM AQUECEDOR DE ROLAMENTO OU UM BANHO DE ÓLEO LIMPO AQUECIDO PARA AQUECER A PISTA INTERNA DO ROLAMENTO. NÃO USE UM MAÇARICO POIS ASSIM DANIFICARÁ O ROLAMENTO.

1. Coloque a pista interna do rolamento em um aquecedor de rolamentos ou em um banho de óleo limpo aquecido e aqueça até aproximadamente 230°F (Figura 5-14). Não use um maçarico para aquecer a pista interior, pois assim danificará a pista.
2. Usando luvas de isolamento, remova a pista interna aquecida do aquecedor de rolamentos, e logo em seguida deslize no mancal de rolamento até que se encaixe no ombro da parte superior do recipiente. Permita que a pista interna refrigere até ficar imóvel sobre a parte superior do recipiente de sólidos.
3. Deslize o defletor do pillow block interno no eixo, seguido pela tampa do pillow block. Não aperte o parafuso de ajuste do defletor neste momento.
4. Posicione a pista externa do rolamento e roletes no chanfro do pillow block. Usando uma ferramenta adequada que entre em contato apenas a pista externa, cuidadosamente escoste a pista externa no pillow block até aproximadamente 1/8" abaixo da superfície do pillow block.
5. Instale um novo anel em O de pequena seção cruzada no ombro da tampa interna do pillow block e deslize a tampa do pillow block no eixo.
6. Aplique quantidade suficiente da graxa de rolamento listada na especificação do cliente para cobrir completamente os rolamentos de rolete.
7. Deslize o conjunto do pillow block e pista externa do rolamento para a pista interna previamente instalada no rolamento de rolete.

8. Instale um novo anel em O de seção cruzada contra o ombro da tampa externa do pillow block, deslize a tampa do pillow block no eixo e apóie no pillow block.
9. Oriente a tampa interna do pillow block de modo que a borda plana esteja alinhada com a parte inferior do pillow block.

Rolamento da Extremidade de Liquido (Continuação)

Figura 5-14 Detalhes da Instalação do Rolamento Principal

10. Aplique um composto antiengripante em quatro parafusos de cabeça chata e instale parafusos para fixar a tampa interna do pillow block ao pillow block. Aperte os parafusos de acordo com as *Especificações do Torque das ferragens* nesta seção.
11. Oriente a tampa externa do pillow block de modo que a borda plana esteja alinhada com a parte inferior do pillow block.
12. Aplique um composto antiengripante em quatro parafusos de cabeça chata e instale parafusos para fixar a tampa externa do pillow block ao pillow block e puxe o rolamento à posição adequada dentro do pillow block. Aperte os parafusos de acordo com as *Especificações do Torque das Ferragens* nesta seção.
13. Deslize o defletor externo do rolamento na polia, mas deixe o parafuso folgado.

14. Aplique uma camada fina de graxa na superfície do eixo do recipiente onde a polia é montada.
15. Aqueça a polia a 200°F. Durante o manuseio com luvas isoladas, oriente o encaixe da polia com a chave no eixo da parte superior do recipiente de sólidos e instale a polia no eixo. Fixe a polia com parafusos.
16. Deslize os defletores de pillow block internos e externos próximo às tampas dos pillow blocks, deixando cerca de 1/16 polegada de espaço livre e aperte os parafusos de ajuste em ambos os defletores.
17. Instale as tampas dos defletores e fixe os parafusos.
18. Opere o guincho para abaixar o conjunto rotativo para dentro da centrífuga até que os pillow blocks entrem em contato com a base.
19. Insita os pinos de alinhamento nos buracos de alinhamento do pillow block e introduza os parafusos. Remova os parafusos do pillow block de acordo com as *Especificações do Torque das Ferragens* nesta seção.

SUBSTITUIÇÃO DO ROLAMENTO DO TRANSPORTADOR CONTÍNUO

Este procedimento exige a remoção do conjunto do transportador do conjunto do recipiente. A substituição do rolamento do transportador deve ser realizada em local limpo e por pessoal devidamente treinado e qualificado.

Se os rolamentos do transportador estiverem defeituosos, é provável que o transportador vá precisar de uma revisão completa. Por conseguinte, todas as peças devem ser cuidadosamente inspecionadas, e encaixes e folgas devem ser medidos para determinar a adequação de peças para reutilização.

Remoção

A extremidade de líquidos contém dois rolamentos de pressão, e um rolamento de esferas individuais é instalado na extremidade de sólidos do transportador. Substitua todos os rolamentos do transportador como um conjunto se vibração excessiva, folga axial ou folgas radiais forem encontradas. O procedimento seguinte descreve a remoção do rolamento da extremidade de líquidos e, em seguida, o rolamento da extremidade de sólidos. Para remover os rolamentos do transportador, faça o seguinte:

1. Retire o transportador do conjunto rotativo em conformidade com a *Manutenção Preventiva* nesta seção.
2. Com o transportador apoiado, remova os parafusos que prendem o suporte de elevação ao transportador e remova o suporte de elevação.
3. Retire o rolamento de encosto da extremidade de líquidos do seguinte modo:
    a. Retire os parafusos que prendem o alojamento de retenção da extremidade de líquidos (Figura 5-12) ao alojamento do rolamento e remova o alojamento de retenção. Remova e descarte os anéis em O instalados nas ranhuras externas do alojamento de retenção.
    b. Usando um extrator adequado do tipo martelo, remova ambos os rolamentos do alojamento de rolamentos da extremidade de líquidos. Descarte os rolamentos.
    c. Remova o anel de retenção que prende o retentor no alojamento de retenção e remova e descarte o retentor.

4. Retire o rolamento de pressão da extremidade de sólidos do seguinte modo:
    a. Retire os parafusos que prendem o alojamento de retenção e o alojamento de rolamentos (Figura 5-13) ao transportador e remova o alojamento de retenção e o alojamento de rolamentos. Separe o alojamento de retenção do alojamento de rolamentos.
    b. Remova o anel de retenção que prende o alojamento de retenção. Remova e descarte de o retentor e o anel em O do alojamento de retenção.
    c. Extraia o rolamento do alojamento de rolamento e descarte o rolamento.
    d. Remova o anel de retenção que prende o retentor no alojamento de rolamento e remova e descarte o retentor.
    e. Retire a mola ondulada do eixo da parte superiora do recipiente de sólidos.

Limpeza, Inspeção e Reparo.

1. Limpe todos os componentes com um limpador adequado/desengraxante, e seque com ar comprimido filtrado. Remova qualquer corrosão para facilitar a inspeção.
2. Inspecione os eixos da parte superior dos recipientes em busca de arranhões, amassados, rebarbas ou deformações que possam afetar aptidão para retornar ao serviço. Uniformize quaisquer menores defeitos de superfície. Substitua a parte superior do recipiente se o eixo estiver claramente deformado ou falhas graves forem encontradas que impossibilitem a manutenção da parte superior do recipiente.
3. Inspecione alojamentos de rolamentos e de retenção em busca de corrosão, distorção, amassados, rachaduras, rebarbas, fraturas ou outros defeitos. Conserte quaisquer defeitos menores.
4. Verifique se a mola ondulada da parte superior do recipiente de sólidos manteve a sua tensão. Substitua se a tensão danificada for insuficiente.
5. Substitua qualquer componente que apresente dano que não possa ser facilmente reparado. Substitua todos os retentores, anéis em O e rolamentos.
6. Teste o ajuste de uma nova pista interna de rolamentos no alojamento de rolamentos de ambas as partes superiores dos recipientes. Se o furo for pequeno, a pista interna irá deslizar facilmente para o furo. Substitua o alojamento(s) de rolamento se o buraco estiver folgado.
7. Coloque todos os componentes limpos em sacos plásticos para evitar contaminação.

Instalação

A instalação do rolamento é o inverso da remoção. As peças devem estar limpas e o procedimento deve ser realizado em um ambiente limpo para evitar a contaminação dos rolamentos novos. Certifique-se de substituir todos os rolamentos do transportador como um conjunto. Os rolamentos de encosto da extremidade de líquidos são instalados primeiro, seguidos da instalação do rolamento da extremidade de sólidos.

1. Para instalar o rolamento da extremidade de líquidos, faça o seguinte:
    a. Inserir um novo retentor no alojamento de retenção da extremidade de líquidos (Figura 5-12), e prenda com anel de retenção. Instale novos anéis em O nas ranhuras externas do alojamento de retenção.
    b. Coloque um novo rolamento de encosto no furo do alojamento de rolamento e, utilizando uma ferramenta adequada, bata no rolamento uniformemente para dentro do lugar oposto

ao ombro do alojamento de rolamento. Oriente o segundo rolamento de encosto com um número da peça virado para cima para facilitar a identificação e instalar no alojamento em cima do rolamento anterior.

c. Instale novos anéis em O nas ranhuras externas do alojamento de retenção.

d. Posiciono o alojamento de retenção no alojamento de rolamento e prenda com parafusos. Aperte os parafusos de acordo com as *Especificações do Torque das Ferragens* nesta seção.

2. Para instalar o rolamento do transportador da extremidade de sólidos, proceda da seguinte forma:

   a. Inserir um novo retentor no alojamento de retenção da extremidade de sólidos (Figura 5-13), e prenda com anel de retenção.

   b. Instale um novo anel em O na ranhura externas do alojamento de retenção.

   c. Insira um novo retentor no alojamento de rolamento e prenda com anel de retenção.

   d. Insira um novo rolamento no alojamento de rolamento e assente completamente contra o ombro.

   e. Insira o alojamento de rolamento na abertura do transportador, coloque os retentores sobre o alojamento do rolamento e prenda ambos os alojamentos ao transportador com parafusos. Torça os parafusos de acordo com as *Especificações do Torque das Ferragens* nesta seção.

3. Reinstale o transportador no conjunto do recipiente e instale o conjunto do recipiente na centrífuga de acordo com *a Manutenção Preventiva* nesta seção.

LISTA DE FERRAMENTAS

A lista ferramentas a seguir inclui todas as ferramentas e equipamentos fornecidos para facilitar a manutenção da centrífuga DE-1000 VFD. Cada componente é listado com o número da peça, quantidade fornecida, e utilização ou aplicação.

LISTA DE FERRAMENTAS DA CENTRÍFUGA DE-1000 VFD		
Nº DA PEÇA.	**DESCRIÇÃO / USO**	**QTD**
Allen 33212	Chaves Allen de braço Longo, 3/32" a 1/2" *Várias peças do conjunto rotativo*	1
Allen 41216	Soquete Allen, de Parafusadeira 1/2" x 1/2" *Várias peças do conjunto rotativo*	1
Parafuso Allen 14MM	Chave Allen, 14 MM *Várias peças do conjunto rotativo*	1
OTC-1039	Extrator para Rolamentos, 2-Garra, Alcance de 10", Abertura máxima das garras 0" a 12" *Remover a pista interna do rolamento principal do eixo da parte superior do recipiente de líquido*	1

LISTA DE FERRAMENTAS DA CENTRÍFUGA DE-1000 VFD		
Nº DA PEÇA.	**DESCRIÇÃO / USO**	**QTD**
HXCBF038-16X250	Parafuso Jack de cabeça sextavada, com 3/8-16 x 2-1/2" de comprimento *Separar a caixa de engrenagens do flange*	2
HXCBF031-18X400	Parafuso Jack de cabeça sextavada, com 5/16-18 x 4” de comprimento *Separar a alojamento do rolamento do transportador do eixo da parte superior do recipiente da extremidade de líquido*	4
HXCBF038-16X400	Parafuso Jack de cabeça sextavada, com 3/8-16 x 4” de comprimento *Separar o alojamento do rolamento do transportador do eixo da parte superior do recipiente da extremidade de Sólido*	4
10792-00	Suporte de Elevação Vertical *Suspender o transportador do conjunto do recipiente de líquido*	1
10791-00	Suporte Vertical *Apóia o conjunto do recipiente de líquido verticalmente durante a manutenção*	1
WFSS-31	Arruelas Lisas de 5/16" *Prender o suporte de elevação vertical à flange da caixa de engrenagens*	6
NHHS-31-18	Porca sextavada, pesado, 5/16-18 *Prender o suporte de elevação vertical à flange da caixa de engrenagens*	6
SKCS-38-16x175	Parafuso de Cabeça Cilíndrica, 3/8-16 x 1-3/4 " *Prender o suporte de elevação vertical à flange da caixa de engrenagens*	4
RED-B150X125	Bucha, sextavada, 1-1/4 "x 1-1/2" *Reduzir a abertura do tubo de alimentação*	1
CHE-SRI-2	Graxa, Padão* *Lubrificar rolamentos principais e ranhuras da caixa de engrenagens*	1
Aeroshell GR-14	Graxa, Ártico* *Lubrificar rolamentos principais e ranhuras da caixa de engrenagens*	1
OLHAL-S31-18X113	Parafuso Olhal, 3/8 "x 1-1/8" *Suspender o conjunto rotativo pelo flange da caixa de engrenagens*	2

LISTA DE FERRAMENTAS DA CENTRÍFUGA DE-1000 VFD		
Nº DA PEÇA.	**DESCRIÇÃO / USO**	**QTD**
PP1127	Bomba de Graxa, Diâmetro do tubo 1/2”, 14.5 Oz *Injetar graxa dentro da caixa de engrenagens e nos encaixes do rolamento principal*	2

ESPECIFICAÇÕES DAS FERRAGENS DE TORQUE

Use apenas as ferragens que são aprovadas pela Corporação Derrick. O uso de ferragens não aprovado pela Derrick e possivelmente inferior pode resultar em lesões graves aos funcionários e / ou danos ao equipamento. Além disso, qualquer garantia em vigor, seja escrita ou implícita, pode ser anulada por uso de FERRAGENS não aprovado. Entre em contato com a Derrick Corporation com perguntas relativas ao tipo de equipamento e o uso associado a centrífugas Derrick.

ATENÇÃO! O USO DE FERRAGENS DE QUALIDADE INFERIOR NÃO APROVADAS PELA DERRICK E PODE RESULTAR EM LESÕES GRAVES AOS FUNCIONÁRIOS E/OU DANOS AO EQUIPAMENTO.

Especificações recomendadas de torque de assentamento, lubrificantes e outras especificações de instalações de equipamentos para os vários tipos e tamanhos de equipamentos usados na centrífuga são mostradas nas Figuras 5-15 e 5-16.

Use o procedimento a seguir quando apertar equipamentos:

1. Use apenas um torquímetro calibrado.
2. Aplique lubrificante especificado no equipamento antes de instalar.
3. Ao apertar mais de um parafuso, alterne entre os parafusos.
4. Sempre aborde o torque final em várias fases.

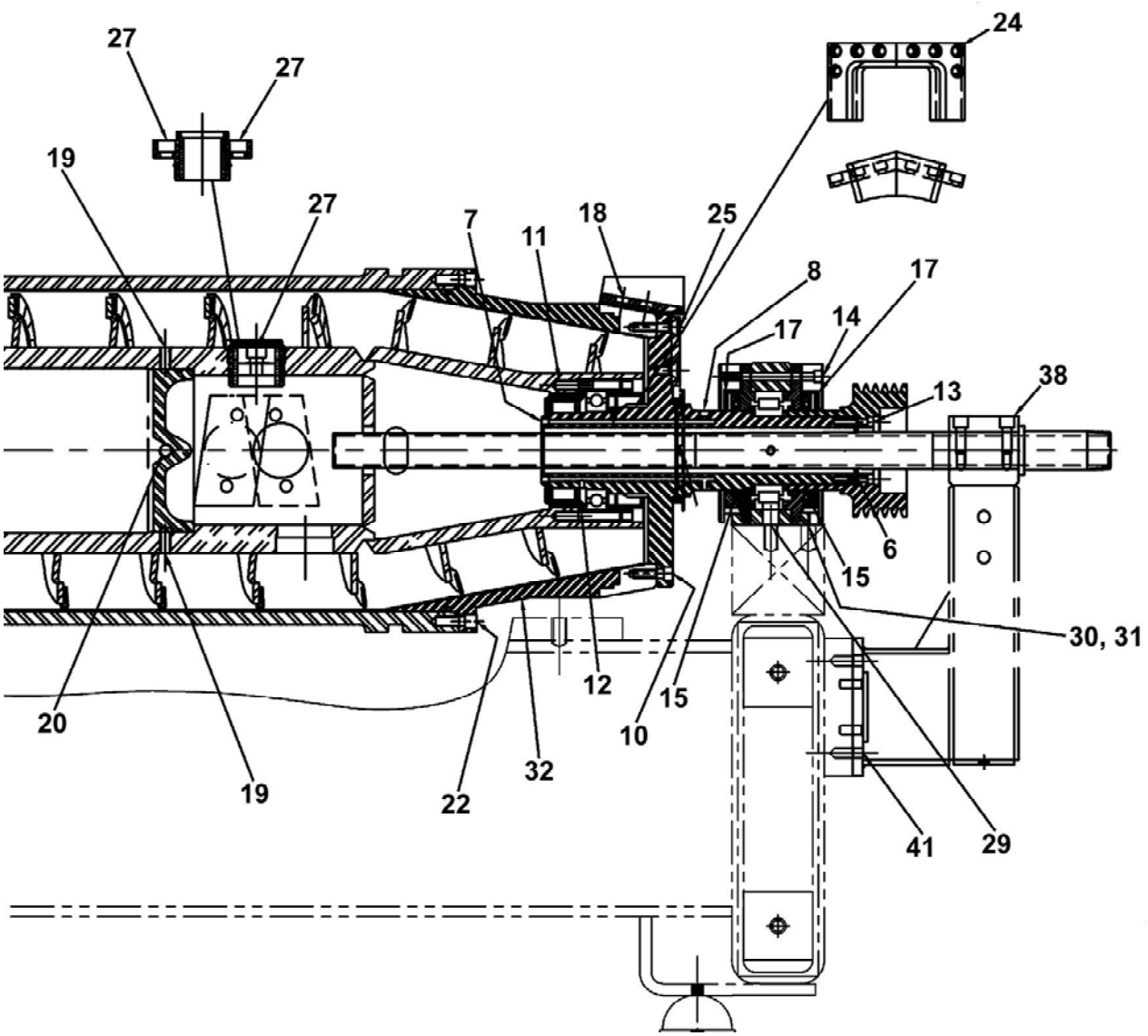


Figura 5-15 Localização do Equipamento do Conjunto Rotativo - Extremidade de Sólidos

ESPECIFICAÇÕES DE TORQUE DAS FERRAGENS DA EXTREMIDADE DE SÓLIDOS					
Nº	**Descrição**	**Qtd**	**Lubrificante**	**Torque**	**Localização**
6	Pino de 1/4 x 1-1/4	4	Loctite 680	N/A	Parte Superior do Recipiente da extremidade de Sólido
7	Parafuso de ajuste de 5/16-18 x 1/2	2	Loctite 262	N/A	Parte Superior do Recipiente da extremidade de Sólido
8	Graxeira 1/8 NPT x 3/4	2	N/A	N/A	Parte Superior do Recipiente da extremidade de Sólido
10	3/8-16 x 1 Hx Skt Hd	8	Antiengripante	252 pol-lbs	Parte Superior do Recipiente da extremidade de Sólido
11	5/16-18 x 3 Hx Skt Hd	6	Antiengripante	144 pol-lbs	Alojamento de retenção da Extremidade de Sólido
12	Pino de 1/4 x 1	1	Loctite 680	N/A	Alojamento do rolamento da Extremidade de Sólido
13	1-4-20 x 1 Hx Skt Hd	8	Antiengripante	83 pol-lbs	Polia (Roldana)
14	5/16-18 x 4 Hx Hd	6	Antiengripante	Sem especificação	Tampa do Defletor
15	3/8-16 x 1 Flt Hd Hx Skt	16	Antiengripante	183 pol-lbs	Tampa do Pillow Block
17	1/4-20 x 5/8 Hx Skt Hd	4	Antiengripante	144 pol-lbs	Defletor do Pillow Block
18	3/8-16 x 3/4 Hx Skt Hd	8	Antiengripante	252 pol-lbs	Arado de invólucro
19	Parafuso de ajuste de 3/8-16 x 1	2	Antiengripante	75 pol-lbs	Bomba de Alimentação Acelerada
20	Parafuso de ajuste de 1/2-13 x 1	1	Antiengripante	265 pol-lbs	Bomba de Alimentação Acelerada
22	3/8-16 x 1 Hx Skt Hd	12	Antiengripante	252 pol-lbs	Extensão do Recipiente
23	Parafuso de ajuste de 10-24 x 1/4	2	Antiengripante	N/A	Defletor de Involucro
24	5/16-18 x 3/4 Hx Skt Hd	32	Antiengripante	144 pol-lbs	Inserções Desgastáveis
25	3/8-16 x 3/4 Flt Hd Hx Skt	4	Antiengripante	183 pol-lbs	Arado da parte superior de sólidos
27	1/2-13 x 1 Hx Skt Hd	8	Antiengripante	53 pol-lb	Bocal de Alimentação
29	5/8-11 x 2-1/4 Hx Hd	4	Antiengripante	197 libra-pé	Pillow Block
30	Pino #8 (7/16-20 x 2-1/2)	4	Antiengripante	N/A	Pillow Block
31	Pino #7 (3/8-24 x 2-1/2)	4	Antiengripante	N/A	Pillow Block

ESPECIFICAÇÕES DE TORQUE DAS FERRAGENS DA EXTREMIDADE DE SÓLIDOS					
Nº	**Descrição**	**Qtd**	**Lubrificante**	**Torque**	**Localização**
32	Drenagem #8	1	Antiengripante	35 libra-pé	Extensão do Recipiente
38	3/8-16 x 2-1/2 Hx Hd	4	Antiengripante	Sem especificação	Bloco de Montagem do Tubo de Alimentação
41	3/8-16 x 1-1/2 Hx Hd	4	Antiengripante	Sem especificação	Flage de Suporte do Tubo de Alimentação

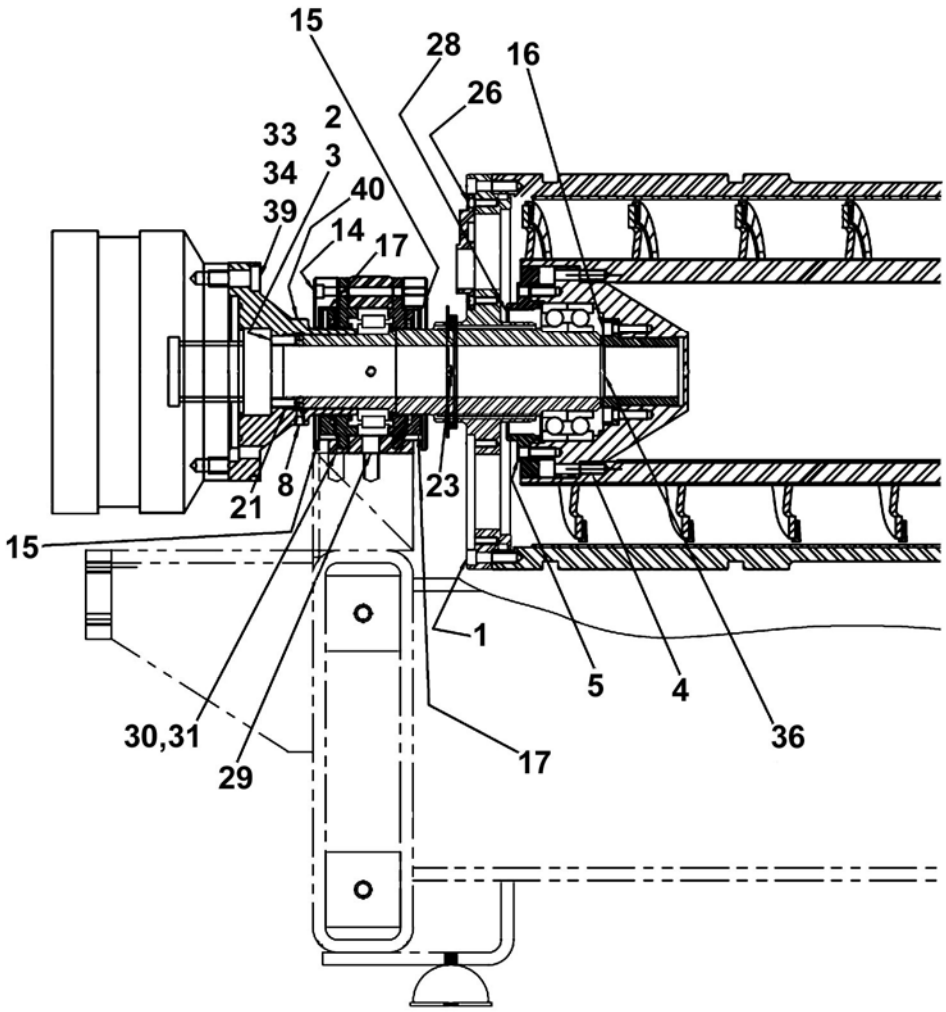


Figura 5-16 Localização do Equipamento do Conjunto Rotativo - Extremidade de Líquidos

ESPECIFICAÇÕES DO TORQUE DO FERRAGENS DA EXTREMIDADE DE LÍQUIDOS					
Nº	**Descrição**	**Qtd**	**Lubrificante**	**Torque**	**Localização**
1	3/8-16 x 1-1/4 Hx Skt Hd	12	Antiengripante	252 pol-lbs	Parte Superior do Recipiente da extremidade de Líquido
2	Pino de 5/16 x 1	*	Loctite 680	N/A	Parte Superior do Recipiente da extremidade de Líquido
3	Chave de 5/16 x 5/16 x 3	1	N/A	N/A	Parte Superior do Recipiente da extremidade de Líquido
4	3/8-16 x 1-1/2 Hx Skt Hd	8	Antiengripante	252 pol-lbs	Alojamento do rolamento da Extremidade de Líquido
5	3/8-16 x 1 Hx Skt Hd	4	Antiengripante	252 pol-lbs	Alojamento de retenção da Extremidade de Líquido
8	1/4 NPT x 3/4 Gr. Ajustando	2	N/A	N/A	Parte Superior do Recipiente da extremidade de Líquido
13	1/4-20 x 1 Hx Skt Hd	8	Antiengripante	83 pol-lbs	Polia (Roldana)
14	5/16-18 x 4 Hx Hd	6	Antiengripante	Sem especificação	Tampa do Defletor
15	3/8-16 x 1 Flt Hx Skt Hd	16	Antiengripante	183 pol-lbs	Tampa do Pillow Block
16	3/8-16 x 1 Hx Skt Hd	8	Antiengripante	252 pol-lbs	Orifício Estriado
17	1/4-20 x 5/8 Hx Skt Hd	4	Antiengripante	144 pol-lbs	Defletor do Pillow Block
21	5/16-18 x 1 Hx Skt Hd	*	Loctite 262	300 pol-lb	Flange Do Rotodiff/Caixa De Engrenagem
23	Parafuso de ajuste de 10-24 x 1/4	2	Antiengripante	N/A	Defletor de Involucro
26	5/16-18 x 7/8 Hx Skt Hd	12	Antiengripante	144 pol-lbs	Porto Efluente
28	Parafuso de ajuste de 3/8-16 x 1/2	2	Antiengripante	N/A	Alojamento de Retenção
29	5/8-11 x 2-1/4 Hx Hd	4	Antiengripante	197 libra-pé	Pillow Block
30	Pino #8 (7/16-20 x 2-1/2)	4	Antiengripante	N/A	Pillow Block
31	Pino #7 (3/24-20 x 2-1/2)	4	Antiengripante	N/A	Pillow Block
34	5/16-18 x 3/4 Hx Skt Hd	6	Antiengripante	N/A	Flange de Caixa de Engrenagens a Caixa de Engrenagens
35	Parafuso de ajuste de 3 mm	**	Antiengripante	N/A	Bloqueio de Porta
36	Pino de 3/8 x 1	2	Loctite 680	N/A	Orifício Estriado
37	Anel de Pressão 30 x 1.5mm x 1.4	**	N/A	N/A	Bloqueio de Porta Rotodiff
40	Parafuso de ajuste de 5/16-18 x 1/2	1	Antiengripante	N/A	Flange para Chave

*2 - 4 nos número de série abaixo de CF000272
2 nos números de série de CF000272 a CF000678
0 nos números de série acima de CF000979

*21 - 4 nos número de série abaixo de CF000272
6 nos números de série de CF000272 a CF000678
9 nos números de série acima de CF000979

**35 & 37 - Não utilizado em números de série acima de CF000678

PEÇAS SOBRESSALENTES RECOMENDADAS

A tabela a seguir lista as peças sobressalentes recomendadas necessárias para apoiar uma única Centrífuga DE-1000 VFD durante dois anos. No entanto, uma vez que todas as substituições de peças em potencial não podem ser previstas, o estoque completo de peças sobressalentes deve ser baseado na experiência do usuário com equipamentos similares.

Peças Sobressalentes Recomendadas - Centrífuga DE-1000 VFD			
Nº da Peça	**Descrição**	**Validade**	**Qtd**
Peças Mecânicas			
BELT-5G3V-1000	Correia Motriz	Sim	1
C000-RA-110-00	Graxa, Alta Velocidade, Rolamento Principal, 16 Oz.	Sim	4
CA1595X1/2-6	Base de Montagem do Isolador	Não	4
CHE-SRI-2	Graxa, Padrão, Rolamento Principal/Transportador, Tubo de 14,5 Oz.	Sim	12
CS10-RA-310-00	Retentores do Rolamento Interno de Apoio	Não	2
CS10-RA-311-00	Retentores do Rolamento Externo de Apoio	Não	2
CS10-RA-312-00	Retentores do Rolamento de Encosto	Não	2
CS10-RA-316-00	Anel em O, Parte Superior do Recipiente de Líquidos	Não	2
CS10-RA-321-00	Anel em O, Extremidade Externa de Líquidos	Não	1
CS10-RA-322-00	Anel em O, Extremidade Interna de Líquidos	Não	1
CS10-RA-323-00	Anel em O, Acelerador de Alimentação	Não	1
CS10-RA-324-00	Anel em O, Bocal de Alimentação	Não	4
CS10-RA-325-00	Anel em O, Extremidade de Sólidos	Não	1
CS10-RA-510-00	Rolamento de Encosto do Transportador	Não	2
CS10-RA-511-00	Rolamento de Apoio ao Transportador	Não	1
CS10-RA-512-00	Rolamento Principal da Extremidade de Sólidos	Não	1

Peças Sobressalentes Recomendadas - Centrífuga DE-1000 VFD			
Nº da Peça	**Descrição**	**Validade**	**Qtd**
CS10-RA-513-00	Rolamento Principal da Extremidade de Líquidos	Não	1
CS10-RA-629-TC	Bocal de Alimentação de Tungstênio	Sim	4
CS10-RA-630-IC	Inserções Desgastáveis da Descarga de Sólidos (8 unidades)	Sim	2 Conjuntos
CS10-RA-634-IC	Arado de invólucro	Sim	2 Pares
CS10-RA-650-IC	Arado da parte superior do recipiente	Sim	4 Pares
SHELL-OMALA320G	Óleo, Caixa de Engrenagem.	Sim	1
9537-00	Acelerador de Alimentação	Não	1
9540-00	Tubo de Alimentação	Não	1
Peças Elétricas			
G0008089	Sensor RTD, Temperatura do Rolamento da Extremidade de Sólidos	Não	1
G0008090	Sensor RTD, Temperatura do Rolamento da Extremidade de Líquidos	Não	1
G0007861	Sensor de Velocidade	Não	1
Peças do Gabinete de Controle			
G0008073	Fusível, Bipolar, Classe J, 50A	Não	1
G0008072	Fusível, Ação Rápida, 50A	Não	2
G0007981	Fusível, 1.5A	Não	3
G0008069	Kit de Fusíveis, Rej Duplo , Pori Sigl, Midget Set	Não	1
G0007589	Fusível, 3A	Não	3
FNQ-R-5	Fusível, 5A	Não	3
G0007583	Fusível, Estilo Cubo, 40A, 600V	Não	3
G0003484	Fusível, Estilo Cubo, 100A, 600V	Não	3
G0002910	Fusível, Tempo de Atraso, 2,5A, 600Vac, Estilo CC	Não	2
G0002911	Fusível, Tempo de Atraso, 7A, 250Vac, Estilo CC	Não	1
G0003565	Filtro de Ar	Sim	1

Peças Sobressalentes Recomendadas - Centrífuga DE-1000 VFD			
Nº da Peça	**Descrição**	**Validade**	**Qtd**
G0008005	Trava da Porta	Não	4
G0008349	Bateria PLC	Sim	1
G0007228	PLC	Não	1
G0007232	Barreira de Segurança Intrínseca, Interruptor de Vibração	Não	1
G0007233	Barreira de Segurança Intrínseca, Sensor RTD	Não	1
G0007234	Barreira de Segurança Intrínseca, Sensor de Velocidade	Não	1
G0003504	Supressor de Oscilação, 120V	Não	1
G0007863	Mouse	Não	1
G0007231	Comutador Ethernet, 6 portas	Não	1
G0007245	Painel de Controle do Operador	Não	1
G0002881	Unidade de Ar Condicionado, 12000 BTU	Não	1
G0003552	Fonte de Alimentação, 24Vdc, 5A	Não	1

SOLUÇÃO DE PROBLEMAS

Embora a falha de equipamento seja improvável, avarias devido a um erro operacional ou outro problema podem resultar em paralização desnecessária da máquina e deve ser corrigida o mais rapidamente possível. Os procedimentos de solução de problemas apresentados nesta seção ajudarão os técnicos a isolar e corrigir avarias.

Procedimento de Solução de Problemas

A análise de falhas deve proceder logicamente da causa mais simples à mais complexa. O problema mais difícil é um desligamento inesperado ou incapacidade de iniciar. Sempre elimine as causas óbvias de mau funcionamento antes de prosseguir com possibilidades mais complexas.

Uma vez que mais de uma causa pode ser responsável por mau funcionamento, o técnico deve proceder metodicamente para eliminar todas as possíveis causas e tomar todas as ações corretivas a cada passo do processo de solução de problemas. Onde mudanças nos procedimentos operacionais é o melhor plano de ação, recomendações adequadas estão incluídas.

Em geral, um desligamento inesperado da centrífuga é devido a uma interrupção de energia elétrica que tenha desligado o motor de acionamento de 50HP. Componentes de segurança são instaladas em áreas-chave do sistema de controle elétrico da centrífuga para desligar o motor elétrico se os parâmetros de segurança, tais como temperatura do motor, vibrações ou torque do transportador são excedidas. A interrupção de energia pode ser devido a um ou mais fatores, incluindo uma falha de energia local.

O gráfico de solução de problemas consiste em modos de falha, possível(eis) causa(s), e plano(s) de ação recomendado(s). Todas as verificações de continuidade elétrica neste procedimento são executadas sem o fornecimento de energia elétrica para a centrífuga. Bloqueie (LO) e etiquete (TO) o equipamento antes de tentar realizar qualquer verificação de continuidade.

ATENÇÃO! VERIFICAÇÕES DE CONTINUIDADE DEVEM SER REALIZADAS SEM ELETRICIDADE FORNECIDA À CENTRÍFUGA. BLOQUEIE (LO) E ETIQUETE (TO) ENERGIA ELÉTRICA ANTES DE TENTAR VERIFICAR A CONTINUIDADE.

Além do gráfico de solução de problemas, o técnico deve consultar a os diagramas esquemáticos e de fiação na Seção 6, e a descrição e teoria de funcionamento da Seção 1 para obter ajuda adicional na solução de problemas.

Verificar Se Há Transportadores Entupidos

A solução de problemas deve começar com a determinação se o transportador está entupido. Para verificar um transportador entupido, proceda da seguinte forma:

1. Desligue, bloqueie (LO) e etiquete (TO) a centrífuga.
2. Remova o conjunto de liberação de sobrecarga da caixa de velocidades e tente girar o eixo do pinhão redutor enquanto impede o recipiente de girar. Se o pinhão pode ser girado de forma independente do recipiente, o transportador não está entupido.
3. Limpe o entupimento de transportador através de lavagem com água ou vapor. Se o transportador não estiver obstruído, continue com os passos da solução de problemas no respectivo gráfico a seguir.

RESOLUÇÃO DE PROBLEMAS DE CENTRÍFUGA-1000 VFD	
Causa Possível	**Procedimento de Isolamento & Ação Corretiva**
Modo de Falha 1: Líquido Aceitável, Bolo Fino Demais	
Insuficiência de Sólidos na Alimentação	Aumente a taxa de alimentação.
	Aumente a abertura da porta de efluentes (consulte DER04800).
	Reduza a velocidade diferencial.
Queda na taxa da bomba de alimentação	Aumente a taxa de alimentação.
	Verifique a bomba de alimentação e, se necessário, verifique o desgaste e substitua peças desgastadas.
	Verifique a retenção do eixo da bomba e corrija eventuais defeitos.
	Selecione RESTAURAR na tela de Restauração de Falhas para reiniciar a taxa de fluxo.
Modo de Falha 2: Baixa Qualidade de Líquidos, Bolo Aceitável	
Velocidade diferencial baixa	Aumente a velocidade diferencial.

RESOLUÇÃO DE PROBLEMAS DE CENTRÍFUGA-1000 VFD	
Causa Possível	**Procedimento de Isolamento & Ação Corretiva**
demais.	Aumente a velocidade e/ou reduza a quantidade de sólidos na alimentação.
Excessiva quantidade de sólidos na alimentação	Reduza a quantidade de sólidos na alimentação ou adicionar fluxo de diluição, se possível.
Mudança nas características de alimentação	Reduza a quantidade de sólidos na alimentação ou as configurações de máquinas em geral, otimizar, ou seja, ajustar a velocidade da bacia, velocidade diferencial, e abrindo açude.
Aumento de sólidos em úmidos	Re-otimize as configurações da máquina.
	Reduza a taxa de alimentação.
	Aumente a abertura do açude (ver *DER04800).*
	Reduza a velocidade diferencial.
	Reduza a abertura do açude se melhor qualidade de líquido é desejada.
Correias do transportador excessivamente gasta. Inspecione as correias através do orifícios de descarga de sólidos	Retire e desmonte o recipiente, e inspecione as correias do transportador (veja *DER05030).* Reparar ou substituir o transportador, se necessário.
Modo de Falha 3: Vibração Excessiva	
O conjunto do recipiente desequilibrado devido ao desgaste mecânico desigual, peças desgastadas ou correia do transportador deformada.	Retire e desmonte o recipiente, e inspecione as correias do transportador (veja *DER05030).* Reparar ou substituir o transportador, se necessário.
Defeito no rolamento do transportador devido à lubrificação insuficiente, produto de retenção vencido, ou o desgaste normal.	Retire e desmonte o recipiente e inspecione o rolamento do transportador (consulte a *DER05017).* Substitua o rolamento do transportador.
Defeito nos rolamentos principais do recipiente.	Remova o conjunto rotativo, e substitua o rolamento (consulte *DER05017).*
Acúmulo excessivo de sólidos no recipiente e/ou transportador.	Execute o procedimento de limpeza (consulte a *DER04800).*

RESOLUÇÃO DE PROBLEMAS DE CENTRÍFUGA-1000 VFD	
Causa Possível	**Procedimento de Isolamento & Ação Corretiva**
Modo de Falha 4: Sem descarga de líquido, Material de alimentação não tratado saindo pela saída de descarga de líquido.	
Acúmulos de sólidos entre as correias, sólidos não são transportados para a descarga, mas sim descarregados com o líquido	Desligue o motor de acionamento da bomba de alimentação e do conjunto do recipiente, mas mantenha o motor do transportador funcionando e permita a entrada de água para limpeza dentro máquina. Se os sólidos emergirem antes do recipiente parar completamente, reinicie a centrífuga.
	Abra a tampa superior e insira a mangueira dentro da abertura de descarga de líquidos e sólidos e lave com enxague de liquido de limpeza o interior do recipiente (de preferência água quente).
	Se a lavagem for malsucedida em limpar o bloqueio, remova o conjunto rotativo e remova o transportador para facilitar uma limpeza meticulosa. (consulte *DER05030*).
Modo de Falha 5: Alto consumo de energia, Máquina obstruída	
Sólidos acumulados dentro do invólucro	Abra a tampa superior, e através dela limpe o interior do invólucro, exterior do recipiente, e a calha de descarga de sólidos.
Modo de Falha 6: Máquina Entupida ao Iniciar Após um Desligamento Breve	
Excessivo volume de sólidos na alimentação devido à sedimentação na linha de fornecimento	Execute o procedimento de limpeza (consulte *DER04800*).
	Evitar futuras repetições limpando a linha de alimentação logo após o desligamento da máquina.
Modo de Falha 7: Desligamento da Máquina Devido ao Consumo Excessivo de Energia Durante a Inicialização	
Calha de descarga entupida	Limpar a calha de descarga de todos os sólidos acumulados.
Modo de Falha 8: Temperatura do Rolamento Principal Excessivamente Alta	
Lubrificação insuficiente	Lubrifique os rolamentos (consulte *DER05030*).
Excesso de graxa	Remova a graxeira, e direcione o jato de ar comprimido filtrado para remover a graxa.
Graxa incorreta	Lubrifique com graxa recomendada (consulte *DER05030*).
Rolamento com defeito	Substitua ambos os rolamentos principais (consulte *DER05017*).

MENSAGENS DE ALARME E DE FALHA

Intervenções são necessárias caso uma mensagem apareça para alertar o operador do acontecimento de alguma anomalia. Mensagens de alarme significam que a condição atual deve ser corrigida ou a centrífuga pode ser desligado automaticamente. Mensagens de falha informam ao operador que uma falha que exige desligamento automático ocorreu.

Consulte a tabela a seguir para mensagens de alarme e falha, suas causas e ações corretivas para assistência em analisar as mensagens.

Mensagens de alarme e de falha	
Causa	**Ação Corretiva**
Falha por sobrecarga no motor do Compressor do Ar Condicionador	
Motor puxando corrente em excesso	Troque o motor do compressor do ar condicionado, em caso de defeito, ou remova outra causa do consumo de corrente excessiva.
Falha por sobrecarga no motor do Ventilador Interno do Ar Condicionador	
Motor puxando corrente em excesso	Troque o motor do ventilador interno, em caso de defeito, ou remova outra causa do consumo de corrente excessiva.
Falha de Pressão Alta ou Baixa no Refrigerante do Ar Condicionado	
Verifique a pressão do refrigerante, pressão alta indica sobrecarga, e pressão baixa indica vazamentos no sistema	Se a pressão estiver alta, reduza a quantidade de refrigerante, se baixa, corrija o(s) vazamento(s) e carregue o sistema novamente.
Velocidade Máxima do Recipiente Excedida, Desligamento	
Conexão incorreta ou solta do sensor de velocidade ou sensor de velocidade com defeito	Se a leitura na tela do status do VFD do Recipiente é de cerca de 4000 RPM, verifique a conexão (consulte *DER03025*), se a conexão estiver segura, substituir o sensor.
O VFD do recipiente permitiu que o recipiente excedesse o limite de velocidade máxima pré-definida	Substitua o VFD do recipiente, e reinicie a centrifugar quando a velocidade de monitoramento estiver próxima.
Alarme de Alto Torque do Recipiente, Reduzir a taxa de alimentação.	
O Torque do recipiente excedeu o limite pré-definido	Reduza a taxa de alimentação.
Falha e Desligamento por Alto Torque do Recipiente, Executar limpeza e reduzir a taxa de alimentação.	
O Torque do recipiente excedeu o limite pré-definido	Após o desligamento automático, execute o procedimento de limpeza para remover o acúmulo de sólidos, e reinicie a centrifugar com a taxa de alimentação reduzida.

Mensagens de alarme e de falha	
Causa	**Ação Corretiva**
Alarme do VFD do Recipiente, Consulte a Seção de Solução de Problemas do Manual do Usuário	
VFD do Recipiente com Defeito	Pressione PARAR, e desligar e depois ligar o ciclo de energia. Se o alarme não sumir, substitua o VFD do Recipiente.
Erro de Comunicação do VFD do Recipiente	
O VFD do Recipiente não está se comunicando com o PLC	Confirme que o LED verde ao lado do cabo Ethernet está aceso, indicando que o hub está funcionando.
	Verifique as conexões entre o VFD e o PLC do recipiente, e corrija eventuais defeitos.
	Substitua o VFD do recipiente, se nenhum outro defeito for encontrado.
Alarme de Limite Excedido do Acionador VFD do Recipiente, Consulte a Seção de Solução de Problemas do Manual do Usuário.	
Motor de Acionamento do Recipiente puxando corrente em excesso	Troque o motor, em caso de defeito, ou remova outra causa do consumo de corrente excessiva.
Desligamento ou Falga do VFD do Recipiente Consulte a Seção de Solução de Problemas do Manual do Usuário	
Detecção de falha do VFD, causando desligamento.	Verifique e substitua o VFD do recipiente.
Alarme de Aviso de Aterramento do VFD do Recipiente Consulte a Seção de Solução de Problemas do Manual do Usuário	
Motor do recipiente tem acesso para aterramento	Verifique se há aterramento no motor do recipiente e conexões para a saída do acionador, e corrija o defeito.
Alarme por Perda de Fase de entrada no VFD do Recipiente, Consulte a Seção de Solução de Problemas do Manual do Usuário	
Aterramento monofásico detectado entre o VFD e o motor	Verifique a fiação entre o VFD e o motor; corrija o(s) defeito(s).
	Verifique o enrolamento do motor para a fase aterrada; remova o aterramento, se houver, ou substitua o motor.
Alarme por Perda de Força do VFD do Recipiente Consulte a Seção de Solução de Problemas do Manual do Usuário	
Perda na entrada de energia ou fornecimento de baixa tensão	Monitore e corrija o(s) defeito(S) na entrada de energia.

Mensagens de alarme e de falha	
Causa	**Ação Corretiva**
Alarme de Sub-tensão do VFD do Recipiente, Consulte a Seção de Solução de Problemas do Manual do Usuário	
Perda na entrada de energia ou fornecimento de baixa tensão	Monitore e corrija o(s) defeito(S) na entrada de energia.
Falha de Comunicação com o Sensor de Velocidade do Recipiente	
Conexão incorreta ou solta do sensor de velocidade ou sensor de velocidade com defeito	Se a leitura na tela do status do VFD do Recipiente é de cerca de 4000 RPM, verifique a conexão (consulte a Seção 3); se a conexão estiver segura, substituir o sensor.
Conexão incorreta no PLC	Verifique se todos os conectores estão firmemente assentados, conforme descrito nesta seção.
Transmissor/Barreira intrínseco do Sensor de velocidade defeituosa	Verifique e substitua o transmissor /barreira intrínseca em caso de defeito.
VFD da Bomba com Defeito	Verifique e substitua o VFD, em caso de defeito.
Falha de Comunicação com o Sensor de Temperatura da Extremidade de Líquido	
Conexão incorreta ou solta no sensor de temperatura	Se a leitura for constantemente entre os 392 °F (200° C) verifique e corrija a conexão (consulte a Seção 3 e o diagrama esquemático eléctrico na Seção 11).
Conexão incorreta no PLC	Verifique se todos os conectores do PLC estão firmemente assentados, conforme descrito na Seção 3.
Sensor de temperatura com defeito	Se a leitura for constantemente entre os 392 °F (200° C), o sensor está com defeito, substitua o sensor.
Transmissor/barreira intrínseca da extremidade de líquido defeituosa ou má conectada	Verifique a conexão e/ou substitua o transmissor, em caso de defeito.
VFD do Recipiente com Defeito	Verifique e substitua o VFD, em caso de defeito
Falha de Comunicação com o Sensor de Temperatura da Extremidade de Sólido	
Conector do sensor de temperatura inseguro ou desconectado	Se a leitura for constantemente entre os 392 °F (200° C) verifique e corrija a conexão (consulte a Seção 3 e o diagrama esquemático eléctrico na Seção 8).
Conexão incorreta no PLC	Verifique se todos os conectores do PLC estão presos, conforme descrito nesta Seção.
Sensor de temperatura com defeito	Se a leitura for constantemente aos 392 °F (200° C), o sensor está com defeito, substitua o sensor.

Mensagens de alarme e de falha	
Causa	**Ação Corretiva**
Falha de Comunicação com o Sensor de Temperatura da Extremidade de Sólido (Cont.)	
Má conexão no Transmissor/barreira intrínseca da extremidade de líquido ou transmissor com defeito	Se a leitura for constantemente aos 392 °F (200° C) Verifique e corrija a conexão, substitua o transmissor, em caso de defeito.
VFD do Recipiente com Defeito	Verifique e substitua o VFD, em caso de defeito.
Programa de Controle Baixando do Cartão de Memória para o Controlador	
Re-carregamento do programa de PLC a partir do cartão de memória concluído	Inicialize a centrífuga, e continue a operação.
Bateria Interna do Controlador Baixa, Substituir	
Conexões da bateria do PLC não seguras	Verifique as conexões, e corrija, se necessário.
Bateria do PLC fraca	Substitua a bateria.
Alarme de Alto Torque do Transportador, Reduzir a taxa de alimentação	
O Torque do transportador excedeu o limite pré-definido	Reduza a taxa de alimentação.
Falha e Desligamento por Alto Torque do Transportador, Executar limpeza e reduzir a taxa de alimentação	
O Torque do transportador excedeu o limite pré-definido	Após o desligamento automático, execute o procedimento de limpeza para remover o acúmulo de sólidos, e reinicie a centrifugar com a taxa de alimentação reduzida.
Alarme do VFD do Transportador, Consulte a Seção de Solução de Problemas do Manual do Usuário	
Cabo de sinal do sensor de temperatura desconectado	Verifique e corrija a conexão (consulte a Seção 3 e o diagrama esquemático eléctrico na Seção 11).
Temperatura do VFD muito alta	Verifique a tela de status do VFD do Transportador para temperatura e alarme; desligue, bloquei (LO), e etiquete (TO) a centrífuga para determinar e corrigir a causa do superaquecimento.
Carga do VFD muito alta	Reduza a taxa de alimentação da bomba.
Erro de Comunicação do VFD do Transportador	
O VFD do transportador não está se comunicando com o PLC	Confirme que o LED verde ao lado do cabo Ethernet está aceso, indicando que o hub está funcionando.
	Verifique as conexões entre o VFD e o PLC do transportador, e corrija eventuais defeitos.
	Substitua o VFD do transportador, se nenhum outro defeito for encontrado.

Mensagens de alarme e de falha	
Causa	**Ação Corretiva**
Desligamento ou Falga do VFD do Transportador Consulte a Seção de Solução de Problemas do Manual do Usuário	
Detecção de falha do VFD, causando desligamento.	Verifique e substitua o VFD do transportador.
Alarme de Aviso de Aterramento do VFD do Transportador Consulte a Seção de Solução de Problemas do Manual do Usuário	
Motor do transportador tem acesso para aterramento	Verifique se há aterramento no motor do transportador e conexões para a saída do acionador, e corrija o defeito.
Alarme por Perda de Fase de entrada no VFD do Transportador, Consulte a Seção de Solução de Problemas do Manual do Usuário	
Aterramento monofásico detectado entre o VFD e o motor	Verifique a fiação entre o VFD e o motor; corrija o(s) defeito(s).
	Verifique o enrolamento do motor para a fase aterrada; remova o aterramento, se houver.
Alarme por Perda de Força do VFD do Transportador Consulte a Seção de Solução de Problemas do Manual do Usuário	
Perda na entrada de energia ou fornecimento de baixa tensão	Monitore e corrija o(s) defeito(S) na entrada de energia.
Alarme de Sub-tensão do VFD do Transportador, Consulte a Seção de Solução de Problemas do Manual do Usuário	
Perda na entrada de energia ou fornecimento de baixa tensão	Monitore e corrija o(s) defeito(S) na entrada de energia.
Alarme de Temperatura Alta no Gabinete Elétrico	
PLC detectou alta temperatura dentro do gabinete de controle	Verifique se o ar condicionado estiver em funcionando, repare ou substitua o ar condicionador, em caso de defeito.
	Reduzir a carga por diminuição o recipiente, da velocidade diferencial do transportador, e/ou da taxa de alimentação da bomba.
	Verifique as temperaturas do VFD (consulte a Seção 4); substitua o VFD caso esteja com defeito.

Mensagens de alarme e de falha	
Causa	**Ação Corretiva**
Falha e Desligamento por Alta temperatura no Gabinete Elétrico	
PLC desligou a centrífuga devido a alta temperatura dentro do gabinete de controle	Verifique se o ar condicionado estiver em funcionando, repare ou substitua o ar condicionador, em caso de defeito.
	Reduzir a carga por diminuição o recipiente, da velocidade diferencial do transportador, e/ou da taxa de alimentação da bomba.
	Verifique as temperaturas do VFD (consulte a Seção 4); substitua o VFD caso esteja com defeito.
A temperatura interior do gabinete de controle está muito elevada, causando o desligamento	Verifique se o ar condicionado está funcionando, repare ou substitua como indicado. Inspecione o interior do gabinete e remover a causa da alta temperatura, se houver. Reinicie a centrífuga após a remoção da causa da alta temperatura.
Interruptor de Parada de Emergência Ativado, Desligamento	
PARAGEM DE EMERGÊNCIA pressionada	Remova o motivo da parada de emergência, e depois reinicie a centrifugar.
Falha de Alta vibração e Desligamento, Corrigir o Problema e Pressionar o botão Restaurar	
Vibração excessiva causou o acionamento do interruptor de vibração, resultando na interrupção da alimentação e desligamento de centrífuga	Conjunto rotativo sobrecarregado ou obstruído, produzindo uma condição de desequilíbrio. Remova o motivo da vibração em excesso, e reinicie a centrifugar.
Alarme de Alta Temperatura do Rolamento Principal da Extremidade de Líquido	
Conector do sensor de temperatura inseguro ou desconectado	Se a leitura for constantemente entre os 392 °F (200° C) verifique e corrija a conexão (consulte a Seção 3 e o diagrama esquemático eléctrico na Seção 8).
Lubrificação do rolamento insuficiente	Lubrificar os rolamentos (consulte a Manutenção Preventiva nesta seção).
Graxa em excesso	Remova a graxeira, e direcione o jato de ar comprimido filtrado para remover a graxa.
Graxa incorreta	Lubrificar com graxa recomendada (consulte a Manutenção Preventiva nesta seção).

Mensagens de alarme e de falha	
Causa	**Ação Corretiva**
Alarme de Alta Temperatura do Rolamento Principal da Extremidade de Líquido (Cont.)	
Rolamento com defeito	Substitua ambos os rolamentos defeituosos (consulte Substituição de Rolamentos nesta seção).
Falha e Desligamento por Alta Temperatura do Rolamento Principal da Extremidade de Líquido	
Lubrificação do rolamento insuficiente	Lubrificar os rolamentos (consulte a Manutenção Preventiva nesta seção).
Graxa em excesso	Remova a graxeira, e direcione o jato de ar comprimido filtrado para remover a graxa.
Graxa incorreta	Lubrificar com graxa recomendada (consulte a Manutenção Preventiva nesta seção).
Rolamento com defeito	Substitua ambos os rolamentos defeituosos (consulte Substituição de Rolamentos nesta seção).
Alarme do VFD da Bomba, Consulte a Seção de Solução de Problemas do Manual do Usuário	
O VFD da bomba precisa ser reinicializado	Pressione PARAR, e desligar e depois ligar o ciclo de energia. Se o alarme não sumir, substitua o VFD da bomba.
Erro de Comunicação do VFD da Bomba	
O VFD da bomba não está se comunicando com o PLC	Confirme que o LED verde ao lado do cabo Ethernet está aceso, indicando que o hub está funcionando.
	Verifique as conexões entre o VFD e o PLC da bomba, e corrija eventuais defeitos.
	Substitua o VFD da bomba, se nenhum outro defeito for encontrado.
Alarme de Limite Excedido do Acionador VFD da bomba, Consulte a Seção de Solução de Problemas do Manual do Usuário.	
Motor de Acionamento da bomba puxando corrente em excesso	Troque o motor, em caso de defeito, ou remova outra causa do consumo de corrente excessiva.
Falha do VFD da Bomba, Consulte a Seção de Solução de Problemas do Manual do Usuário	
Detecção de falha do VFD, causando desligamento.	Verifique e substitua o VFD da bomba.

Mensagens de alarme e de falha	
Causa	**Ação Corretiva**
Alarme de Aviso de Aterramento do VFD da Bomba, Consulte a Seção de Solução de Problemas do Manual do Usuário	
Motor da bomba tem acesso para aterramento	Verifique o moto e as conexões de saída do acionador de aterramento da bomba; remover o aterramento.
Alarme por Perda de Fase de entrada no VFD da Bomba, Consulte a Seção de Solução de Problemas do Manual do Usuário	
Aterramento monofásico detectado entre o VFD e o motor da bomba	Verifique a fiação entre o VFD e o motor; corrija o(s) defeito(s).
	Verifique o enrolamento do motor para a fase aterrada; remova o aterramento, se houver, ou substitua o motor.
	Substitua VFD.
Alarme por Perda de Força do VFD da Bomba, Consulte a Seção de Solução de Problemas do Manual do Usuário	
Perda na entrada de energia ou fornecimento de baixa tensão	Monitore e corrija o(s) defeito(S) na entrada de energia.
Alarme de Sub-tensão do VFD da Bomba, Consulte a Seção de Solução de Problemas do Manual do Usuário	
Perda na entrada de energia ou fornecimento de baixa tensão	Monitore e corrija o(s) defeito(S) na entrada de energia.
Alarme de Alta Temperatura do Rolamento Principal da Extremidade de Sólido	
Lubrificação do rolamento insuficiente	Lubrificar os rolamentos (consulte a Manutenção Preventiva nesta seção).
Graxa em excesso	Remova a graxeira, e direcione o jato de ar comprimido filtrado para remover a graxa.
Graxa incorreta	Lubrificar com graxa recomendada (consulte a Manutenção Preventiva nesta seção).
Rolamento com defeito	Substitua ambos os rolamentos defeituosos (consulte Substituição de Rolamentos nesta seção).
Falha e Desligamento por Alta Temperatura do Rolamento Principal da Extremidade de Sólido	
Lubrificação do rolamento insuficiente	Lubrificar os rolamentos (consulte a Manutenção Preventiva nesta seção).
Graxa em excesso	Remova a graxeira, e direcione o jato de ar comprimido filtrado para remover a graxa.

Mensagens de alarme e de falha	
Causa	**Ação Corretiva**
Graxa incorreta	Lubrificar com graxa recomendada (consulte a Manutenção Preventiva nesta seção).
Rolamento com defeito	Substitua ambos os rolamentos defeituosos (consulte Substituição de Rolamentos nesta seção).

INDICADORES DE CONTROLE DE COMPONENTE

Vários indicadores são fornecidos para exibir o status operacional dos componentes do gabinete de controle. As figuras 5-17 até a 5-20 localizam e definem as indicações apresentadas sobre estes componentes. Se for caso disso, as ações corretivas são incluídas para ajudar o operador em analisar as falhas.

Tensão perigosamente alta está presente no gabinete de controle. Tendo em vista que abrir a porta do gabinete de controle e ignorar o sistema de drenagem do gabinete são necessários para verificar os indicadores, apenas o pessoal treinado e qualificado deve ser autorizado a realizar esses procedimentos. Tenha o máximo cuidado em certificar-se de que a atmosfera ambiente esteja livre de vapores perigosos antes de abrir a porta do gabinete e ignorando o sistema de drenagem.

ATENÇÃO! TENSÃO PERIGOSAMENTE ALTA ESTÁ PRESENTE SÓ O PESSOAL TREINADO E QUALIFICADO DEVE TER PERMIÇÃO PARA ABRIR A PORTA DO GABINETE DE CONTROLE ENQUANTO A ENERGIA ESTIVER LIGADA.

ATENÇÃO! GASES PERIGOSOS PODEM CAUSAR EXPLOSÃO. CERTIFIQUE-SE QUE A ATMOSFERA AMBIENTE ESTEJA LIMPA DE TODOS OS POTENCIAIS GASES EXPLOSIVOS ANTES DE ABRIR A PORTA DO GABINETE DE CONTROLE.

INDICADORES DE CONTROLE DE COMPONENTE (CONT.)

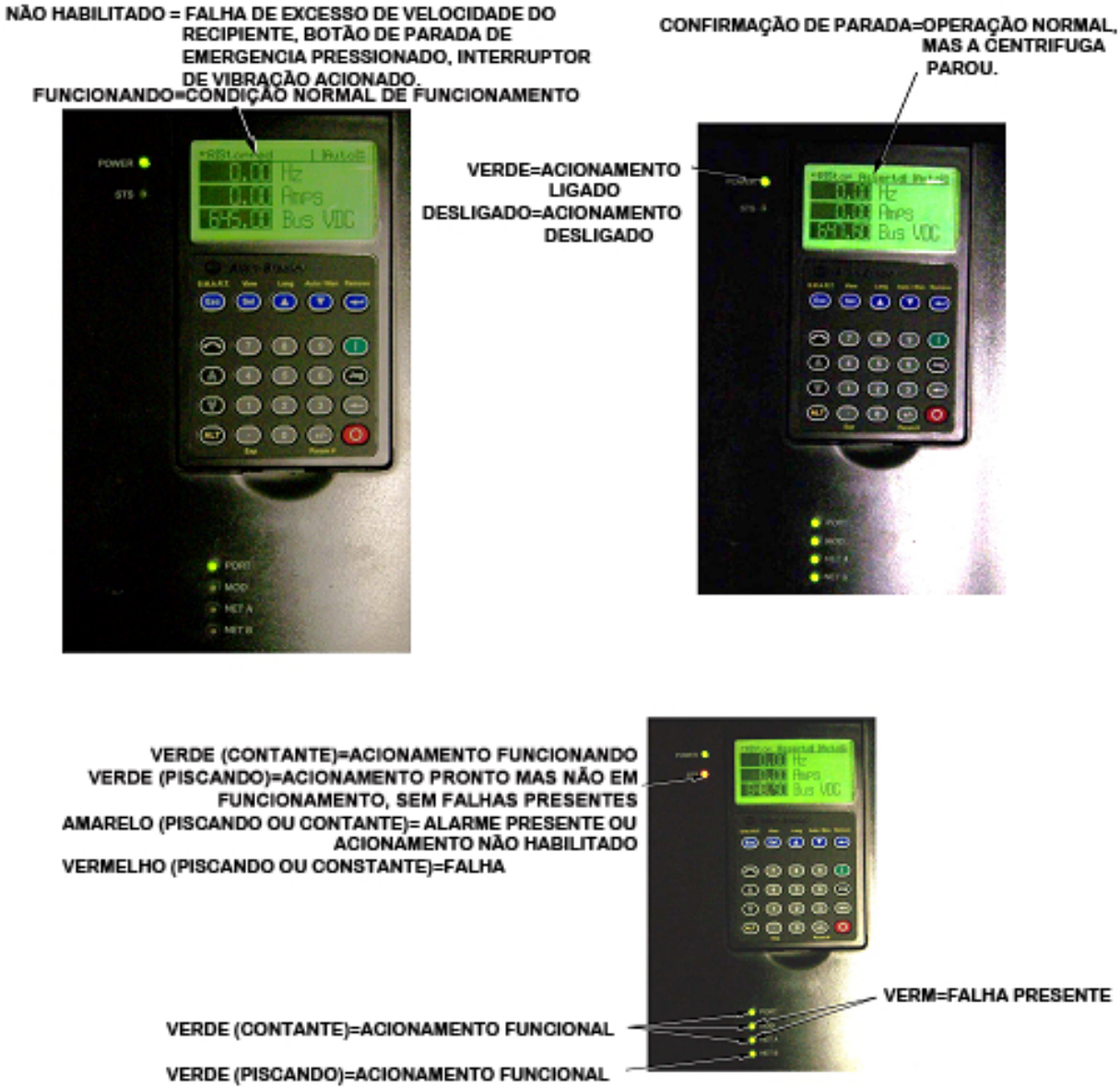


Figura 5-17 Indicadores do VFD

Figura 5-18 Indicadores do PLC

INDICADORES DE CONTROLE DE COMPONENTE (CONT.)

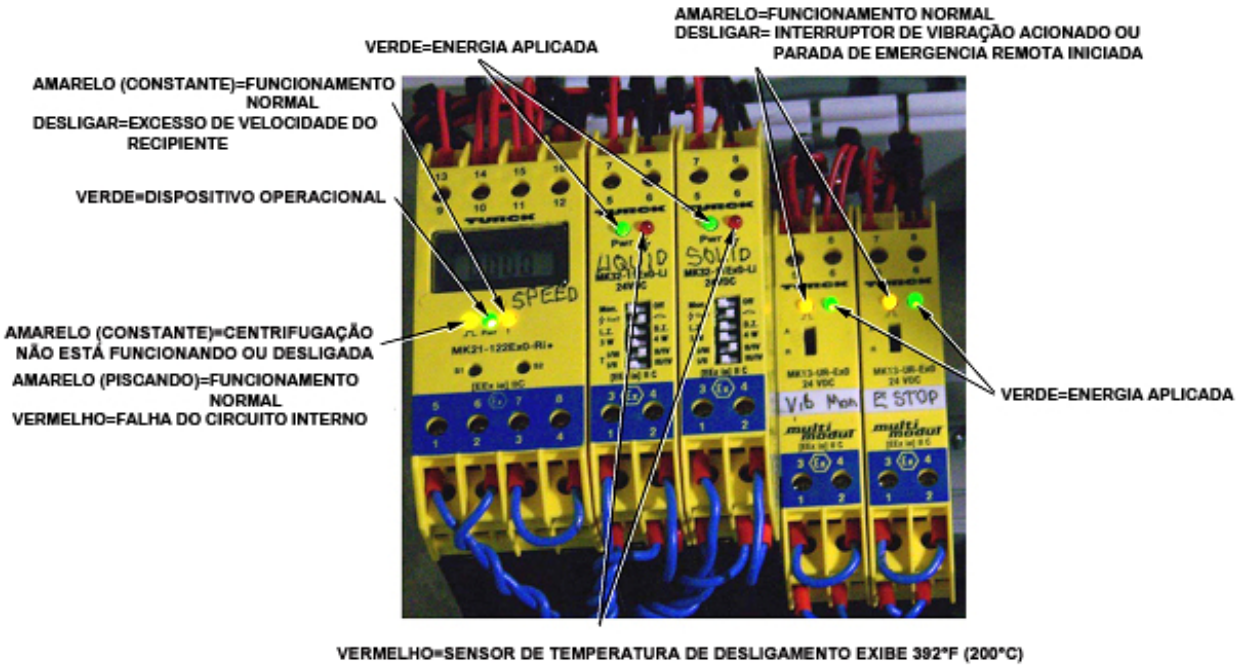


Figura 5-19 Indicadores do Transmissor/ Barreia Intrínseca

Figura 5-20 Indicadores do suprimento de energia

SEÇÃO 8 - DESENHOS DE REFERÊNCIA

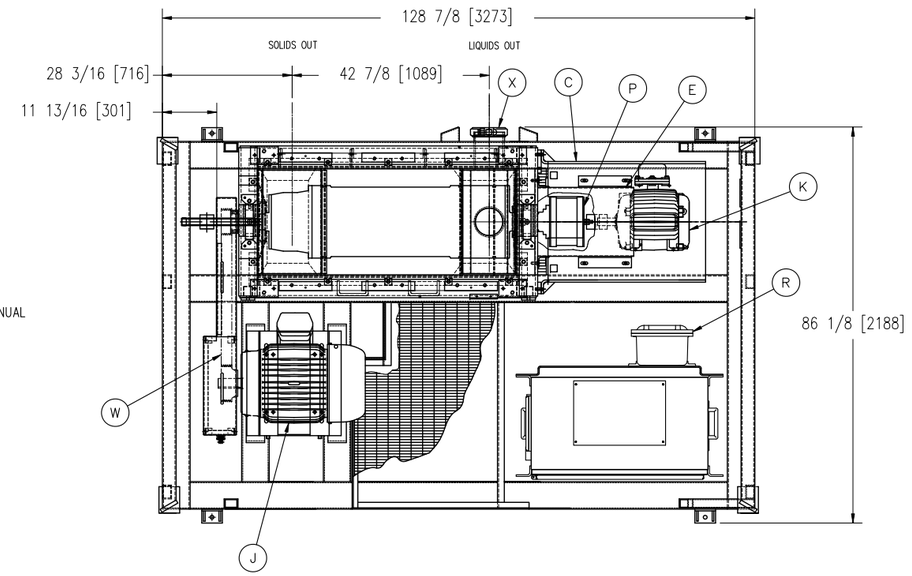
Esta seção contém desenhos de engenharia Derrick para o seu equipamento. Estes desenhos são incluídos para fornecer assistência na solução de problemas, reparo e encomenda de peças.

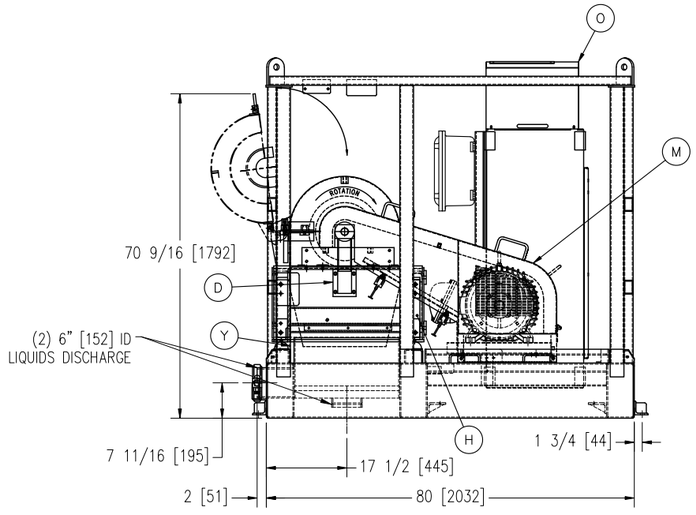
Número	Título
14738-00-004 -	General Arrangement, DE-1000 VFD Centrifuge, 575V
14738-00-006 -	General Arrangement, DE-1000 VFD Centrifuge, 380V
14738-00-007 -	General Arrangement, DE-1000 VFD Centrifuge, 460V
13593-00-009 -	General Arrangement, DE-1000 VFD Centrifuge, Non-XP Centrifuge
14394-00-008 -	Electrical Wiring Schematic, 380/400V 50 Hz Non-XP Centrifuge
14394-00-010 -	Electrical Wiring Schematic, 575/600V 60 Hz, XP Centrifuge
14394-00-017 -	Electrical Wiring Schematic, 380/400V 50 Hz XP Centrifuge
14394-00-018 -	Electrical Wiring Schematic, 460/480V 60 Hz XP Centrifuge
9587-00-005 -	Rotating Assembly, DE-1000 Centrifuge (Radial Flow)
11372-01 -	Gear Unit, DE-1000 Centrifuge, 52:1
10647-00-002 -	Lubrication & Maintenance Schedule, DE-1000 Centrifuge
14894-00 -	Rotating Assembly, Hardware Parts List
16615-00 -	Parts list, DE-1000 Base Sensor System
16622-00-001 -	XP Electrical Control Panel, VFD DE-1000, 575/600V
16622-00-004 -	XP Electrical Control Panel, VFD DE-1000, 380/400V
16622-00-005 -	XP Electrical Control Panel, VFD DE-1000, 460/480V
16545-00-001 -	DE-1000 Control Enclosure Assembly, XP, 575V
16545-00-002 -	DE-1000 Control Enclosure Assembly, XP, 460V
16545-00-004 -	DE-1000 Control Enclosure Assembly, XP, 380V
16545-00 -	DE-1000 Control Enclosure Assembly, Non-XP, 380V

4	4	Z	ENCLOSURE ISOLATOR MOUNT	G0008128
1	1	Y	SOLIDS SAMPLE DOOR	**13327-00**
1	1	X	6" VICTAULIC COUPLING	VIC-6-75
1	1	W	DRIVE BELT	BELT-5G3V-1000
1	1	V	BUSHING - 2.125 BORE	G0003563
1	1	U	HUB SHEAVE - 8.0"	G0003562
△		T		
6	6	S	ISOLATOR MOUNTS	CA1595X1/2-6
1	1	R	ELECTRICAL ENCLOSURE ASSEMBLY	16622-01-001
1	1	Q	SLIDING MOTOR BASE	PER MOTOR
*	*	P	GEAR UNIT 52:1	**13223-22**
1	1	O	CONTROL ENCLOSURE ASSEMBLY	**16545-01-001**
1	1	N	TOOL KIT	**12016-00-001**
1	1	M	BELT GUARD	**9847-01-003**
1	1	L	SKID	**13100-01-006**
*	1	K	MOTOR-20HP	G0008054 *SEE NOTE 5*
*	1	J	MOTOR-50HP	G0008055 *SEE NOTE 5*
1	1	H	BASE	**9589-01-002**
1	1	G	LOWER CASE	**9590-02**
1	1	F	CASE COVER	**9591-02**
1	1	E	GEAR UNIT GUARD	**9856-01-008**
1	1	D	FEED TUBE SUPPORT	**9539-01**
1	1	C	20 HP MOTOR MOUNT	**14554-01-003**
1		B	ROTATING ASSEMBLY (HARD SURFACED)	**9587-02-005** *SEE MANUFACTURING SHEET*
	1	A	ROTATING ASSEMBLY W/TILES	**9587-01-005** *SEE MANUFACTURING SHEET*
⊠		02	RADIAL CENTRIFUGE ASSEMBLY (575/60HZ)	
	⊠	01	RADIAL CENTRIFUGE ASSEMBLY (60HZ)	
QTY.		No.	PART NAME	DESCRIPTION

* DESIGNATES AVAILABLE OPTIONS. FOR SPECIFIC INFORMATION PERTAINING TO EQUIPMENT PURCHASED, REFERENCE CENTRIFUGE ORDER INFORMATION SHEET SUPPLIED IN CUSTOMER MAINTENANCE AND OPERATIONS MANUAL.

NOTES:
1) ONE (1) UNIT COMPLETE
2) COATING TYPE: SYSTEM ZRE/UE
3) LUBRICATION: SEE MANUFACTURING SHEET IN MANUAL
   A) MAIN BEARINGS - PER APPLICATION
   B) CONVEYOR BEARINGS - PER APPLICATION
   C) GEAR BOX - PER APPLICATION
4) OPERATING SPEED(S) - SEE MANUFACTURING SHEET IN MANUAL
5) MOTORS ARE EXPLOSION PROOF





APPROX WT 9,700 LBS

△	
5	STATIC LOAD- 9700 LBS [4400 KG]
	MAX TRANS DYNAMIC LOAD-176 LBS [80 KG]

REFERENCE DRAWINGS	
ELECTRICAL COMPONENTS PARTS LIST	16615-00
ELECTRICAL WIRING SCHEMATIC	14394-00-010
LUBRICATION & MAINTENANCE	10647-00-009

REV	CHANGE	CKD	DATE
3	ADDED STATIC AND MAX TRANS DYNAMIC LOADS	DMM/MB	8/13/12
2	ITEM T WAS FEED TUBE (9540-00) REMOVED PER DRR 2250	JDN/EJR	10/19/10
1	UPDATED PART & DRAWING NUMBERS.	CCS	6/7/07

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TITLE: GENERAL ARRANGEMENT FOR VFD CENTRIFUGE (575/60/3)

DWN NVB | CKD | DATE 9/26/00 | SCALE 1:20 | REV 3

C | Y | DWN CCS 4/4/07 | SHEET SIZE F C | CKD

DRAWING NO. 14738-00-004

DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

LO, WE, CENT, MAN

4	4	Z	ENCLOSURE ISOLATOR MOUNT	G0008128
1	1	Y	SOLIDS SAMPLE DOOR	**13327-00**
1	1	X	6" VICTAULIC COUPLING	VIC-6-75
1	1	W	DRIVE BELT	BELT-5G3V-1000
1	1	V	BUSHING	G0003563
1	1	U	HUB SHEAVE - 8.0"	G0003562
⚠		T		
6	6	S	ISOLATOR MOUNTS	CA1595X1/2-6
1	1	R	ELECTRICAL ENCLOSURE ASSEMBLY	16622-01-004
1	1	Q	SLIDING MOTOR BASE	PER MOTOR 15968-01-001
1	1	P	GEAR UNIT 52:1	**13223-22**
1	1	O	CONTROL ENCLOSURE ASSEMBLY	16545-01-004
1	1	N	TOOL KIT	**12016-00-001**
1	1	M	BELT GUARD	**9847-01-003**
1	1	L	SKID	**13100-01-006**
*	1	K	MOTOR-20HP	G0009597
*	1	J	MOTOR-50HP	G0009596
1	1	H	BASE	**9589-01-002**
1	1	G	LOWER CASE	**9590-02**
1	1	F	CASE COVER	**9591-02**
1	1	E	GEAR UNIT GUARD	**9856-01-008**
1	1	D	FEED TUBE SUPPORT	**9539-01**
1	1	C	BACKDRIVE MOTOR MOUNT	**14554-01-003**
1		B	ROTATING ASSEMBLY (HARD SURFACED)	**9587-02-005** *SEE MANUFACTURING SHEET*
	1	A	ROTATING ASSEMBLY W/TILES	**9587-01-005** *SEE MANUFACTURING SHEET*
X		02	RADIAL CENTRIFUGE ASSEMBLY (50HZ)	
	X	01	RADIAL CENTRIFUGE ASSEMBLY (50HZ)	
QTY.		No.	PART NAME	DESCRIPTION

* DESIGNATES AVAILABLE OPTIONS. FOR SPECIFIC INFORMATION PERTAINING TO EQUIPMENT PURCHASED, REFERENCE CENTRIFUGE ORDER INFORMATION SHEET SUPPLIED IN CUSTOMER MAINTENANCE AND OPERATIONS MANUAL.

NOTES:

1) ONE (1) UNIT COMPLETE
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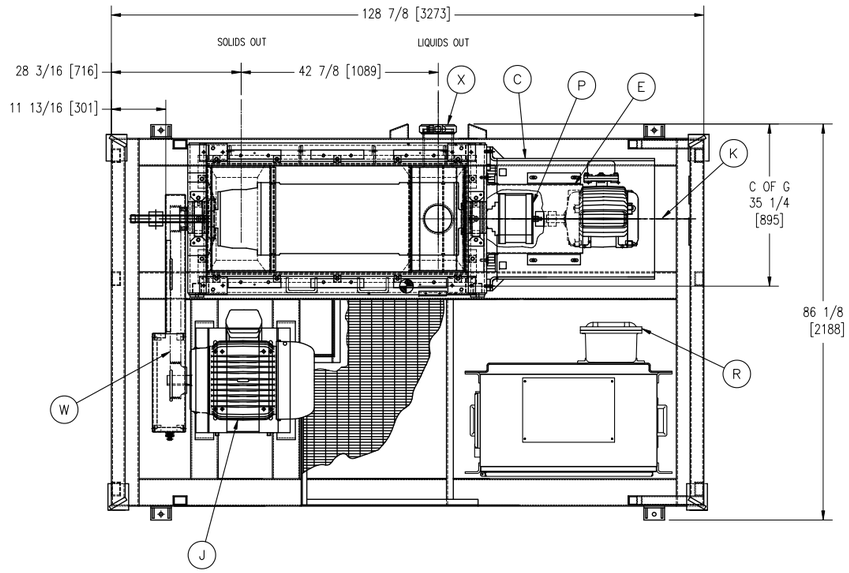
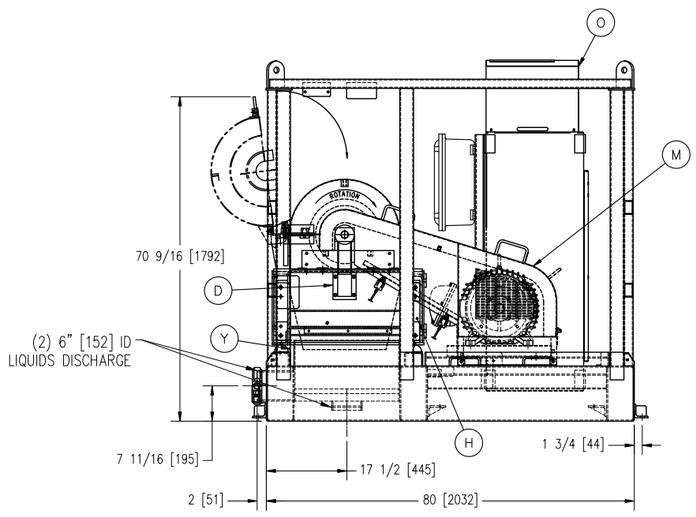
3) LUBRICATION: SEE MANUFACTURING SHEET IN MANUAL
   A) MAIN BEARINGS - PER APPLICATION
   B) CONVEYOR BEARINGS - PER APPLICATION
   C) GEAR BOX - PER APPLICATION
4) OPERATING SPEED(S) - SEE MANUFACTURING SHEET IN MANUAL





APPROX WT 9,000 LBS

⚠ STATIC LOAD- 9000 LBS [4082 KG]
MAX TRANS DYNAMIC LOAD-163 LBS [74 KG]

REFERENCE DRAWINGS	
ELECTRICAL COMPONENTS PARTS LIST	16615-00
ELECTRICAL WIRING SCHEMATIC	14394-00-017
LUBRICATION & MAINTENANCE	10647-00-009

REV	CHANGE	DWN	DATE
3	ADDED STATIC AND MAX TRANS DYNAMIC LOADS	E.R.	8/13/12
2	UPDATED DRAWING NUMBERS		6/30/11
1	ITEM T WAS FEED TUBE (9540-00) REMOVED PER DRR 2250	E.R.	10/18/10

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TITLE: GENERAL ARRANGEMENT FOR DE-1000™ VFD CENTRIFUGE (380/50/3)

DWN NVB | CKD | DATE 9/26/00 | SCALE 1:20 | REV 3

SHEET SIZE C | F C | Y | DWN CCS 7/8/08 | CKD

DRAWING NO. 14738-00-006

DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

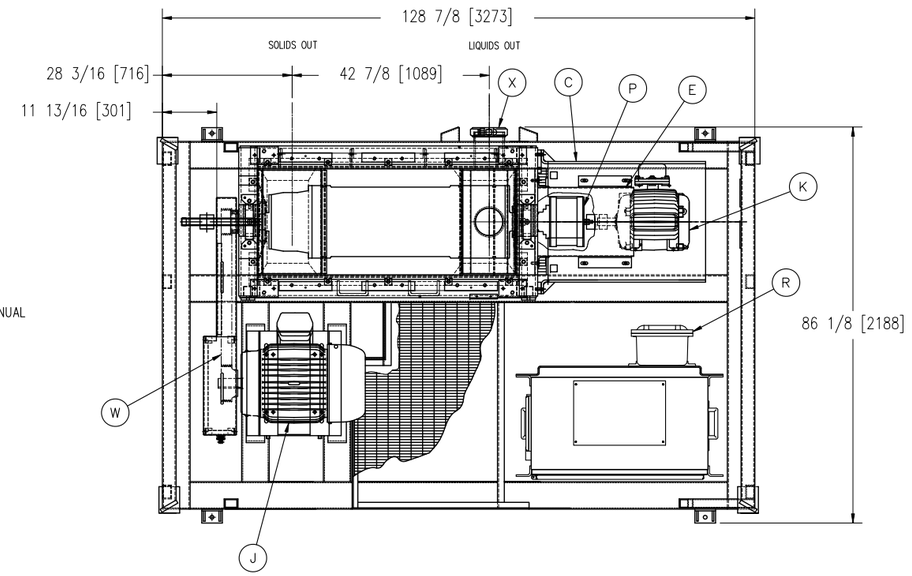
LO, WE, CENT, MAN

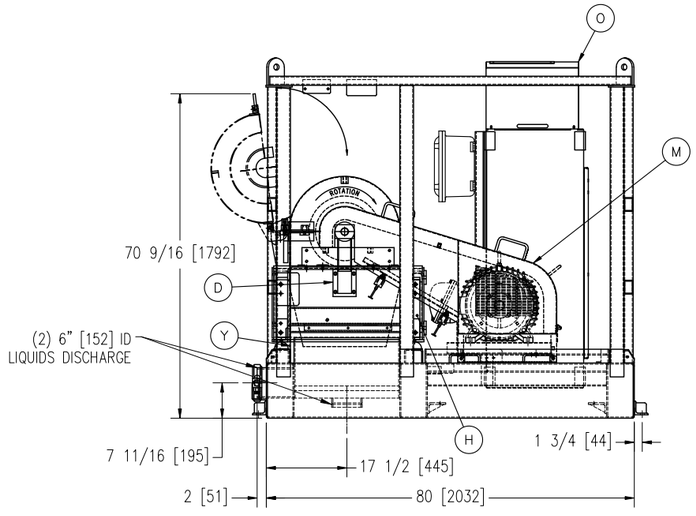
QTY.	No.	PART NAME	DESCRIPTION
4	4	Z	ENCLOSURE ISOLATOR MOUNT	G0008128
1	1	Y	SOLIDS SAMPLE DOOR	**13327-00**
1	1	X	6" VICTAULIC COUPLING	VIC-6-75
1	1	W	DRIVE BELT	BELT-5G3V-1000
1	1	V	BUSHING - 2.125 BORE	G0003563
1	1	U	HUB SHEAVE - 8.0"	G0003562
⚠1			T	
6	6	S	ISOLATOR MOUNTS	CA1595X1/2-6
1	1	R	ELECTRICAL ENCLOSURE ASSEMBLY	16622-01-005
1	1	Q	SLIDING MOTOR BASE	**15968-01-001**
*	*	P	GEAR UNIT 52:1	**13223-22**
1	1	O	CONTROL ENCLOSURE ASSEMBLY	**16545-01-002**
1	1	N	TOOL KIT	**12016-00-001**
1	1	M	BELT GUARD	**9847-01-003**
1	1	L	SKID	**13100-01-006**
*	1	K	MOTOR-20HP	G0009597 *SEE NOTE 5*
*	1	J	MOTOR-50HP	G0009596 *SEE NOTE 5*
1	1	H	BASE	**9589-01-002**
1	1	G	LOWER CASE	**9590-02**
1	1	F	CASE COVER	**9591-02**
1	1	E	GEAR UNIT GUARD	**9856-01-008**
1	1	D	FEED TUBE SUPPORT	**9539-01**
1	1	C	20 HP MOTOR MOUNT	**14554-01-003**
1	*	B	ROTATING ASSEMBLY (HARD SURFACED)	**9587-02-005** *SEE MANUFACTURING SHEET*
*	1	A	ROTATING ASSEMBLY W/TILES	**9587-01-005** *SEE MANUFACTURING SHEET*
X		02	RADIAL CENTRIFUGE ASSEMBLY (460/60HZ)	
	X	01	RADIAL CENTRIFUGE ASSEMBLY (460/60HZ)	

* DESIGNATES AVAILABLE OPTIONS. FOR SPECIFIC INFORMATION PERTAINING TO EQUIPMENT PURCHASED, REFERENCE CENTRIFUGE ORDER INFORMATION SHEET SUPPLIED IN CUSTOMER MAINTENANCE AND OPERATIONS MANUAL.

NOTES:

1) ONE (1) UNIT COMPLETE
2) COATING TYPE: SYSTEM ZRE/UE
3) LUBRICATION: SEE MANUFACTURING SHEET IN MANUAL
   A) MAIN BEARINGS - PER APPLICATION
   B) CONVEYOR BEARINGS - PER APPLICATION
   C) GEAR BOX - PER APPLICATION
4) OPERATING SPEED(S) - SEE MANUFACTURING SHEET IN MANUAL
5) MOTORS ARE EXPLOSION PROOF





APPROX WT 9,700 LBS

⚠	STATIC LOAD- 9700 LBS [4400 KG]
	MAX TRANS DYNAMIC LOAD-176 LBS [80 KG]

REFERENCE DRAWINGS	
ELECTRICAL COMPONENTS PARTS LIST	16615-00
ELECTRICAL WIRING SCHEMATIC	14394-00-018
LUBRICATION & MAINTENANCE	10647-00-009

REV	CHANGE	CKD	DATE
3	ADDED STATIC AND MAX TRANS DYNAMIC LOADS	DMM EJR	8/13/12
2	UPDATED DRAWING NUMBERS	DMM	6/30/11
1	ITEM T WAS FEED TUBE (9540-00) REMOVED PER DRR 2250	EJR	1/31/11

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TITLE: GENERAL ARRANGEMENT FOR DE-1000™ VFD CENTRIFUGE (460/60/3)

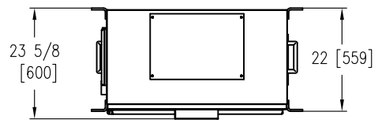
DWN NVB | CKD | DATE 9/26/00 | SCALE 1:20 | REV 3

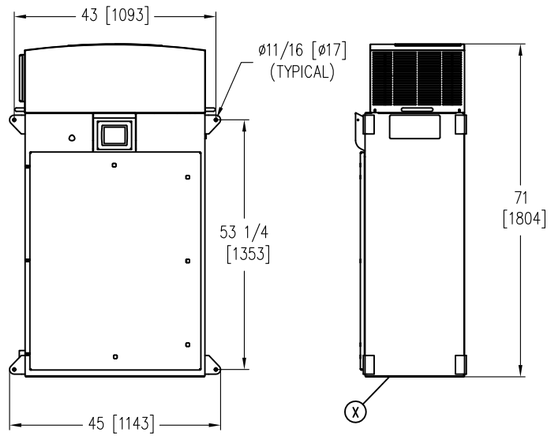
C | Y | DWN CCS 9/3/08 | SHEET SIZE F C | CKD

DRAWING NO. 14738-00-007

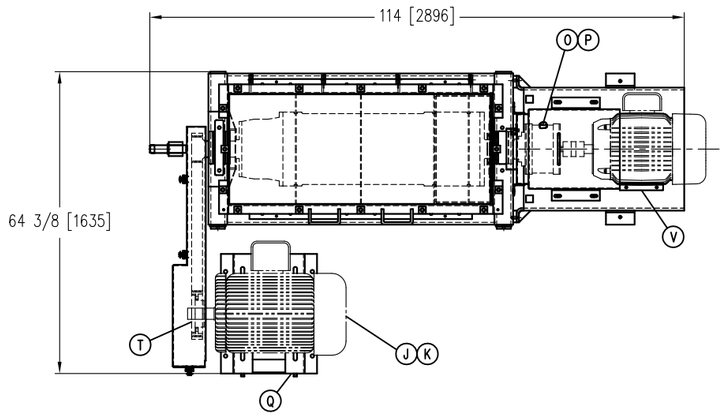
DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

LO, WE, CENT, MAN





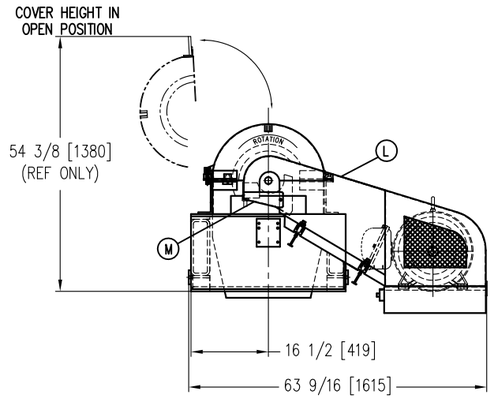
NOTES:
1) ONE (1) UNIT COMPLETE
2) COATING TYPE: SYSTEM ZRE/UE
3) LUBRICATION: SEE MANUFACTURING SHEET IN MANUAL
   A) MAIN BEARINGS – PER APPLICATION
   B) CONVEYOR BEARINGS – PER APPLICATION
   C) GEAR BOX – PER APPLICATION
   D) DRIVE CLUTCH – PER APPLICATION
   E) TORQUE OUT ASSEMBLY – PER APPLICATION
4) OPERATING SPEED(S) – SEE MANUFACTURING SHEET IN MANUAL
5) SUPPORT SKID SUPPLIED BY OTHERS

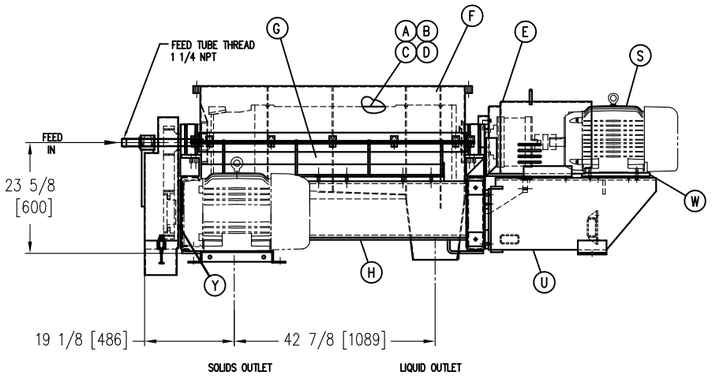


APPROX WT 1250 LBS

3	1	1	1	1	Y	MOTOR SHAFT GUARD	16000-01
1	1	–	1	–	X	CONTROL ENCLOSURE	16545-01
	2	2	2	2	W	MOTOR SHIM	15763-01-001
	2	2	2	2	V	ALIGNING ANGLE	14998-01-002
	1	1	1	1	U	MOTOR MOUNT	14554-01-002
	1	1	1	1	T	HUB SHEAVE	TO SPECIFICATION
	1	1	1	1	S	ELECTRIC MOTOR	TO SPECIFICATION
4					R		
	1	1	1	1	Q	SLIDING MOTOR BASE	**15988-01**
	*	*	*	*	P	GEAR UNIT 52:1	**13223-01**
	*	*	*	*	O	GEAR UNIT 125:1	**13223-00**
	1	1	1	1	N	TOOL KIT	**10795-00**
	1	1	1	1	M	BELT GUARD CAP	**15984-00**
	1	1	1	1	L	BELT GUARD	9847-01-004
	1		1		K	ELECTRIC MOTOR	TO SPECIFICATION
		1		1	J	ELECTRIC MOTOR	TO SPECIFICATION
	1	1	1	1	H	BASE	9589-01-002
	1	1	1	1	G	LOWER CASE	**9590-02**
	1	1	1	1	F	CASE COVER	**9591-02**
	1	1	1	1	E	GEAR UNIT GUARD	9856-01-007
	*	*			D	ROTATING ASSEMBLY (HARD SURFACED)	**9587-59-003** (PARTS LIST)
	*	*			C	ROTATING ASSEMBLY W/TILES	**9587-00-003** (PARTS LIST)
			*	*	B	ROTATING ASSEMBLY (HARD SURFACED)	**9587-59-001** (PARTS LIST)
			*	*	A	ROTATING ASSEMBLY W/TILES	**9587-00-001** (PARTS LIST)
X					04	AXIAL CENTRIFUGE ASSEMBLY (50HZ)	13593-04-009
	X				03	AXIAL CENTRIFUGE ASSEMBLY (60HZ)	13593-03-009
		X			02	RADIAL CENTRIFUGE ASSEMBLY (50HZ)	13593-02-009
			X		01	RADIAL CENTRIFUGE ASSEMBLY (60HZ)	13593-01-009
QTY					ITEM	PART NAME	DESCRIPTION

* DESIGNATES AVAILABLE OPTIONS. FOR SPECIFIC INFORMATION PERTAINING TO EQUIPMENT PURCHASED, REFERENCE CENTRIFUGE ORDER INFORMATION SHEET SUPPLIED IN CUSTOMER MAINTENANCE AND OPERATIONS MANUAL.





APPROX WT 4500 LBS

DIMENSIONS IN [ ] = MILLIMETERS

REFERENCE DRAWINGS	
LUBRICATION & MAINTENANCE	10647-00-008
4 WIRE SCHEMATIC	14394-00-008

REV	CHANGE	CKD	DATE
4	ITEM R FEED TUBE (9540-00) REMOVED PER DRR 2250	DJK	3/1/11
3	ADDED ITEM Y.	CCS	8/30/07
2	UPDATED CABINET, VIEWS & DIMENSIONS.	CCS	11/16/06
1	ADDED ITEM X; ADDED VIEW.	CCS	10/26/06
4	ADDED WIRE SCHEMATIC REFERENCE.	CCS	9/14/07

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TITLE: GENERAL ARRANGEMENT FOR DE-1000™ CENTRIFUGE

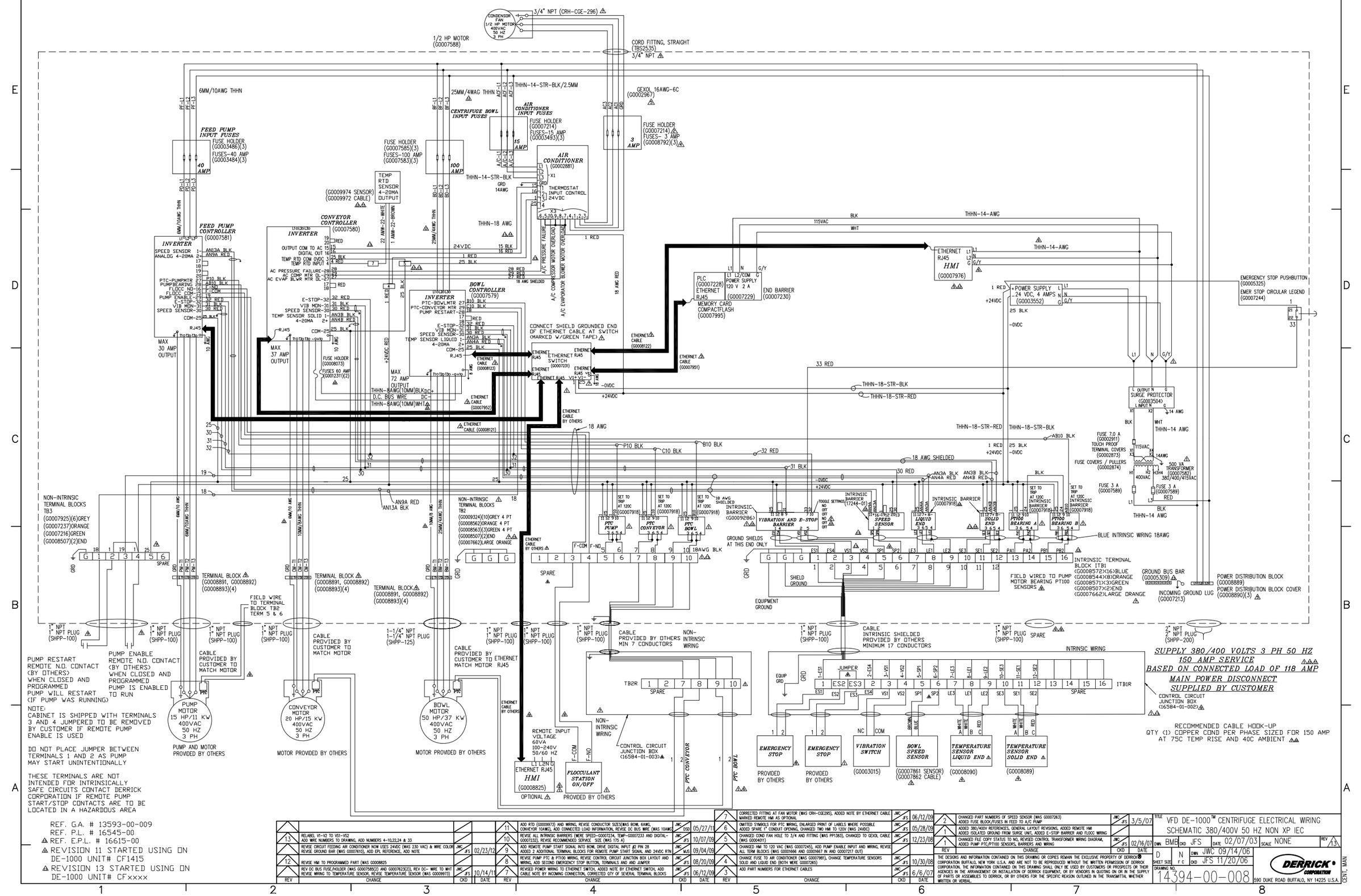
DWN TOC | CKD | DATE 7/21/97 | SCALE 1:20 | REV 4

SHEET SIZE C | N | DWN CCS 6/28/05 | F C | CKD

DRAWING NO. 13593-00-009

DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

LO, WE, SH, CENT



REV	CHANGE	CKD	DATE
13	RELABEL V1-V2 TO V3-V52 ADD WIRE NUMBERS TO DRAWING, ADD NUMBERS 4-10,22,24 & 33	JWC JFS	02/23/12
12	REVISE HMI TO PROGRAMMED PART (WAS G0008825	JWC	
11	REVISE CIRCUIT FEEDING AIR CONDITIONER NOW USES 24VDC (WAS 230 VAC) & WIRE COLOR REVISE GROUND BAR (WAS G0007610), ADD EPL REFERENCE, ADD NOTE REV DC BUS FUSE/HOLDER (WAS G0007585(2) AND G0007623(2)), REV DC- WIRE TO WHT REVISE WIRING TO TEMPERATURE SENSOR, REVISE TEMPERATURE SENSOR (WAS G0009973)	JWC JFS JWC	10/14/11
10	ADD RTD (G0009973) AND WIRING, REVISE CONDUCTOR SIZES(WAS BOWL 6AWG, CONVEYOR 10AWG), ADD CONNECTED LOAD INFORMATION, REVISE DC BUS WIRE (WAS 10AWG) REVISE ALL INTRINSIC BARRIERS (WERE SPEED-G0007234, TEMP-G0007233 AND DIGITAL-G0007232), REVISE RECOMMENDED SERVICE SIZE (WAS 175 A)	JWC JFS	05/27/11 10/07/09
9	ADD REMOTE PUMP START SIGNAL INTO BOWL DRIVE DIGITAL INPUT #2 PIN 28. ADDED 2 ADDITIONAL TERMINAL BLOCKS FOR REMOTE PUMP START SIGNAL AND 24VDC RTN	JWC WJS	09/04/09
8	REVISE PUMP PTC & PT100 WIRING, REVISE CONTROL CIRCUIT JUNCTION BOX LAYOUT AND WIRING, ADD SECOND EMERGENCY STOP BUTTON, TERMINALS AND AND JUMPER	JWC JFS	08/20/09
7	REVISED POWER WIRING TO ETHERNET SWITCH, ADDED NOTE BY ETHERNET SWITCH, ADD CABLE NOTE BY INCOMING CONNECTION, CORRECTED QTY OF SEVERAL TERMINAL BLOCKS	JWC JFS	06/12/09
7	CORRECTED FITTING AT FAN MOTOR (WAS CRH-CGE295), ADDED NOTE BY ETHERNET CABLE MARKED REMOTE HMI AS OPTIONAL	JWC JFS	06/12/09
6	OMITTED SYMBOLS FOR PTC WIRING, ENLARGED PRINT OF LABELS WHERE POSSIBLE ADDED SPARE 1" CONDUIT OPENING, CHANGED TWO HMI TO 120V (WAS 24VDC)	JWC JFS	05/28/09
5	CHANGED COND FAN HOLE TO 3/4 AND FITTING (WAS PP1383), CHANGED TO GEXOL CABLE (WAS G0004011)	JWC JFS	12/23/08
4	CHANGED HMI TO 120 VAC (WAS G0007245), ADD PUMP ENABLE INPUT AND WIRING, REVISE ALL TERM BLOCKS (WAS G0001666 AND G0001667 IN AND G0007217 OUT) CHANGE FUSE TO AIR CONDITIONER (WAS G0007981), CHANGE TEMPERATURE SENSORS SOLID AND LIQUID END (BOTH WERE G0007265)	JWC JFS	10/30/08
3	ADD PART NUMBERS FOR ETHERNET CABLES	JWC JFS	6/6/07
REV	CHANGE	CKD	DATE
2	CHANGED PART NUMBERS OF SPEED SENSOR (WAS G0007263) ADDED FUSE BLOCK/FUSES IN FEED TO A/C PUMP	JWC JFS	3/5/07
1	ADDED 380/400V REFERENCES, GENERAL LAYOUT REVISIONS, ADDED REMOTE HMI ADDED ISOLATED GROUND FROM SURGE UNIT, ADDED E-STOP BARRIER AND FLOCC WIRING		
	CHANGED FILE COPY STATUS TO NO, REVISED CONTROL TRANSFORMER WIRING DIAGRAM, ADDED PUMP PTC/PT100 SENSORS, BARRIERS AND WIRING	JWC JFS	02/16/07
REV	CHANGE	CKD	DATE

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TITLE: VFD DE-1000™ CENTRIFUGE ELECTRICAL WIRING SCHEMATIC 380/400V 50 HZ NON XP IEC

DWN	CKD	DATE	SCALE	REV
BMB	JFS	02/07/03	NONE	13

SHEET SIZE	DRAWING NO.
D	14394-00-008

DWN	CKD	DATE
JWC	JFS	09/14/06
F C	JFS	11/20/06

DERRICK CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

CENT, MAN

CONDENSOR FAN 1/2 HP MOTOR 480VAC 60 HZ 9 PH

CORD FITTING, 90° (CRH-EL296)

XP CABLE ASSY (16AWG-6C) W/XP GLAND (G0009767)

CORD FITTING, STRAIGHT (TBS2535) 2

3/4" NPT

1/2 HP MOTOR (G0007588)

THHN/THWN 14 AWG

AIR CONDITIONER INPUT FUSES

AIR CONDITIONER (G0002881)

THERMOSTAT INPUT CONTROL

FUSE HOLDER (G0007214) FUSES-3.0 A (G0007589X3) 3.0 AMP

575VAC

350VA TRANSFORMERS 480V PRI/ 120V SEC (G0008057) (2)

JUMPER X2 - H3 (2) X2 - H4 (2)

480VAC 3.0kVA

AIR CONDITIONER INPUT FUSES

FUSE HOLDER (G0007214) FUSES-5 AMP (FNQ-R-5X3) 5.0 AMP

A/C PRESSURE FAILURE

A/C COMPRESSOR MOTOR CR

A/C EVAP BLOWER MOTOR CR

24 VDC

THHN-18 AWG

1 RED

25 BLK

4 RED

22 WHT

1 AMP-22-BROWN

22 AWG-22-WHITE

+5VDC RED

0VDC BLK

GND 14AWG

THHN/THWN - 14 AWG

TEMP RTD SENSOR 4-20MA OUTPUT

(G0009972 CABLE) (G0009974 SENSOR)

CONDENSOR MOTOR INPUT FUSES

FUSE HOLDER (G0007214) FUSES-3 AMP (G0008792X3) 3 AMP

FEED PUMP INPUT FUSES

FUSE HOLDER (G0003486X3) FUSES-40 AMP (G0003484X3) 40 AMP

THHN/THWN 10 AWG

CENTRIFUGE BOWL INPUT FUSES

FUSE HOLDER (G0007583X3) FUSES-100 AMP (G0007583X3) 100 AMP

THHN/THWN 4 AWG

RED 28 18 AWG SHIELDED

RED 29

RED 27

20 HP INVERTER CONVEYOR CONTROLLER (G0008053)

15-OUTPUT COM TO AC

16-DIGITAL OUT

3-TEMP RTD COM 0VDC-

4-TEMP RTD INPUT

A/C EVAP BLWR DL-27

A/C COMP MTR DL-29

A/C PRESS FAIL DL-28

E-STOP-32

VIB MON-31

SPEED SENSOR-30

SPARE-29

PUMP RESTART-28

SPARE-27

TEMP SENSOR 1- LIQUID 4-20MA 2+

COM-25

ANGL BLK

ANGL RED

MAX 62 AMP OUTPUT

RJ45

ETHERNET CABLE (G0008123)

ETHERNET SWITCH (G0007231)

ETHERNET RJ45 V1 V2 V3

CONNECT SHIELD GROUNDED END OF ETHERNET CABLE AT SWITCH (MARKED W/GREEN TAPE)

ETHERNET CABLE (G0007951)

ETHERNET CABLE (G0007952)

ETHERNET CABLE (G0008121)

PLC (G0007228) ETHERNET RJ45

POWER SUPPLY 120 V 2 A (G0007229) (G0007230)

MEMORY CARD COMPACTFLASH 256 MB (G0007995)

DISPLAY COVER (15181-01-001)

USB

HMI (G0007976)

USB/PS2 ASSY (17006-02)

PS2

IDC

MOUSE/POINTER ASSY (17006-01)

BLK L1 THHN - 14 AWG

120VAC WHT N

THHN - 14 AWG

POWER SUPPLY 24 VDC 5 AMPS (G0003536)

18 AWG SHIELDED (G0007696)

PURGE SYSTEM (G0007865)

1/2" NPT CORD FITTING (G0004418)

TUBE (G0009864)

ELBOW (G0009863)

RELIEF VALVE (G0008006)

18 AWG SHIELDED (G0007696) (RED WIRE ONLY)

EMERGENCY STOP PUSHBUTTON (G0005325)

EMER STOP CIRCULAR LEGEND (G0007244)

SURGE PROTECTOR (G0002504)

FUSE 7 A (G0002911)

TOUCH PROOF TERMINAL COVERS (G0002873) FUSE COVERS/ PULLERS (G0002874)

500 VA TRANSFORMER (G0004986)

FUSE 2 A (G0009182)

POWER DISTRIBUTION BLOCK (G0008889)

POWER DISTRIBUTION BLOCK COVER (3-G0008890)

TERMINAL BLOCK (G0008891) (G0008892) (G0008893)(4)

NON-INTRINSIC TERMINAL BLOCKS TB2 (G0009324) GREEN 4 PT (G0008562)(7) GREY 4 PT (G0008563) ORANGE 4 PT (G0008507)(2) END

INTRINSIC BARRIER (G0009286) 100Ω SETTINGS NO OFF OFF

INTRINSIC BARRIER (17244-01)

INTRINSIC BARRIER (G0007918)

VIBRATION MONITOR

SPEED SENSOR

LIQUID END

SOLID END

BLUE INTRINSIC WIRING 18AWG

GROUND BUS BAR (G0005309)

INCOMING GROUND LUG (G0007213)

INTRINSIC TERMINAL BLOCKS ITB1 (G0008572)(14)BLUE (G0008544)ORANGE (G0008571)GREEN (G0008507)(2)END (G0007662) LARGE ORANGE

GROUND SHIELDS THIS END ONLY

EQUIPMENT GROUND

SPARE

1" NPT PLUG (SHPP-100)

1" NPT

1" NPT PLUG (SHPP-100)

CORD FITTING BY OTHERS

1 1/2" NPT CORD FITTING (G0008809)

1 1/2" NPT CORD FITTING (G0001686)

1/2" NPT CORD FITTING (G0001687)

2-1/2" NPT CORD FITTING (G0009811)

2" NPT

INTRINSICALLY RATED SHIELDED CABLE 18AWG-18CU

(16584-01-005)

VIBRATION SWITCH (G0003015 SWITCH) (G0007163 CABLE)

SPEED SENSOR (G0007861 SENSOR) (G0007862 CABLE)

TEMPERATURE SENSOR LIQUID END (G0008090)

TEMPERATURE SENSOR SOLID END (G0008089)

MARINE CABLE ASEEMBLY (4C-#8AWG) (G0012463)

MARINE CABLE ASSEMBLY (4C-#4AWG) (G0012462)

RECOMMENDED CABLE (4C-#8AWG) PROVIDED BY CUSTOMER

PUMP RESTART REMOTE N.O. CONTACT (BY OTHERS) WHEN CLOSED AND PROGRAMMED PUMP WILL RESTART (IF PUMP WAS RUNNING)

PUMP ENABLE REMOTE N.O. CONTACT (BY OTHERS) WHEN CLOSED AND PROGRAMMED PUMP IS ENABLED TO RUN, WHEN OPEN PUMP WILL STOP

NOTE: CABINET IS SHIPPED WITH TERMINALS 3 AND 4 JUMPERED, TO BE REMOVED BY CUSTOMER IF REMOTE PUMP ENABLE IS USED

DO NOT PLACE JUMPER BETWEEN TERMINALS 1 AND 2 AS PUMP MAY START UNINTENTIONALLY

THESE TERMINALS ARE NOT INTENDED FOR INTRINSICALLY SAFE CIRCUITS CONTACT DERRICK CORPORATION IF REMOTE PUMP START/STOP CONTACTS ARE TO BE LOCATED IN A HAZARDOUS AREA

POWER CABLE XP SIZED FOR 22A MAX-PROVIDED BY OTHERS

PUMP MOTOR NOT TO EXCEED 15 HP

PUMP AND MOTOR PROVIDED BY CUSTOMER

XP REDUCER 2"NPT-1 ½"NPT (G0012559)

1 1/4" NPT

2" NPT

(G0008054)

(G0008055)

GEXOL MARINE CABLE ASSEMBLY (G0012461) #1AWG-4C

XP ENCLOSURE ASSY (16422-01-001) XP ENCLOSURE (G0008929)

GROUND LUG (G0008896)

CENTRIFUGE POWER JUNCTION BOX

INTRINSIC BARRIER (G0009286) SET TO NO. W3-OFF, SC-OFF

100AMP CONTACTOR (G0008601)

FUSE 1.25 A (G0002926)

FUSE 0.4 A (G0008999) 600VAC

FUSE 0.4 A (G0008999)

100 VA TRANSFORMER (G0009000)

XP CABLE ASSY (20AWG-2C) W/XP GLAND (17382-01)

2" NPT PLUG (SHPP-200)

SUPPLY 575 VOLTS 3 PH 60 HZ
RECOMMEND 125 AMP SERVICE
BASED ON CONNECTED LOAD OF 97 AMPS

MAIN POWER DISCONNECT SUPPLIED BY CUSTOMER

RECOMMENDED CABLE HOOK-UP
QTY (1) COPPER COND PER PHASE SIZED FOR 125 AMP AT 75C TEMP RISE AND 40C AMBIENT
USE XP SEALING GLAND FOR A 2" NPT ENTRY

REF: CA#14738-00-004
REF: P.L. #16545-00-001
REF: EPL #16615-00

REVISION 5 STARTED USING ON DE-1000 UNIT# CF001353

REVISION 10 STARTED USING ON DE-1000 UNIT# CF001415

REVISION 14 & 15 STARTED USING ON DE-1000 UNIT# CF1714

REV	CHANGE	CKD	DATE
15	ADD RELIEF VALVE, REVISE COND FAN CABLE, REVISE PURGE INTRINSIC CABLE REVISE DC BUS WIRE SIZE (WAS 10AWG), ADD G0007662 LARGE BARRIER ORANGE	JWC MC	06/06/12
14	RELABEL V1-V2 TO VS1-VS2, ADD WIRE NUMBERS 4,10,12,13 &22 REVISE GROUND WIRE SIZES, ADD WIRE LABELS AT JUNCTION BOX 16584-01-005, OMIT 2 SPARE TERMINALS	JWC JFS	03/08/12
13	REFER TO PAPER SPACE FOR REVISIONS 1-12, REVISE POWER INCOMING CABLE TO ASSEMBLY (WAS G0007866 & G0008065), REVISE BOWL CABLE TO ASSEMBLY (WAS G0008066 AND G0007154), REVISE CONVEYOR CABLE TO ASSEMBLY (WAS G0008067 & G0008068) REVISE WIRING OF RTD TO CONVEYOR DRIVE (WAS INCORRECTLY SHOWN ON PUMP)	JWC JFS	02/01/12
14	REVISE CIRCUIT FEEDING AIR CONDITIONER-NOW USES 24VDC (WAS 230 VAC) & WIRE COLOR ADD NOTE, REVISE ADAPTER (WAS CRH-RE-44), REVISE END STOPS (WERE G0007012)	JWC JFS	03/08/12

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TITLE: VFD XP DE-1000™ CENTRIFUGE
ELECTRICAL WIRING SCHEMATIC 575V 60 HZ

DWN JFS DATE 02/07/03 SCALE NONE REV 15

CKD JFS DATE 02/07/03

DWN JFS 04/09/07

SHEET SIZE D N F C CKD

DRAWING NO. 14394-00-010

DERRICK® CORPORATION 590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

CENT, MAN

CONDENSER FAN 0.5 HP MOTOR 380 VAC 50 Hz 3 PH

1/2 HP MOTOR (G0007588)

ELBOW 3/4 "(CRH-EL296)

CABLE ASSY W/XP CABLE GLAND 16AWG-6C (G0009767) 1

3/4" NPT CORD FITTING (TBS2535) 2

PURGE SYSTEM (G0007865)

LS SWITCH

+ BLU

2 CLR

1/2" NPT CORD FITTING (G0004418)

TUBE (G0009864) 1

ELBOW (G0009863)

RELIEF VALVE (G0008006) 15

FEED PUMP INPUT FUSES

FUSE HOLDER (G0003486)(3)

FUSES-40 AMP (G0003484)(3)

40 AMP

CENTRIFUGE BOWL INPUT FUSES

FUSE HOLDER (G0007585)(3)

FUSES-100 AMP (G0007583)(3)

100 AMP

AIR CONDITIONER INPUT FUSES

FUSE HOLDER (G0007214)

FUSES-15 AMP (G0003493)(3)

15 AMP

FUSE HOLDER (G0007214)

FUSES-3.0 AMP (G0008792)(3)

3.0 AMP

AIR CONDITIONER (G0002881)

THERMOSTAT INPUT CONTROL 24 VDC X3

TEMP RTD SENSOR 4-20MA OUTPUT

(G0009974 SENSOR) (G0009972 CABLE) 4

CONVEYOR CONTROLLER 15KW/20HP (G0007580)

FEED PUMP CONTROLLER 11KW/15HP (G0007581)

BOWL CONTROLLER 37KW/50HP (G0007579)

THHN-18 AWG

24VDC

115VAC

PLC (G0007228) BATTERY (G0008349) ETHERNET RJ45 MEMORY CARD COMPACTFLASH 256 MB (G0007995)

POWER SUPPLY 120 V 2 A (G0007229)

END BARRIER (G0007230)

ETHERNET RJ45 *HMI* (G0007976)

USB/PS2 ASSY (17006-02) 2 12

MOUSE/POINTER ASSY (17006-01)

POWER SUPPLY 24 VDC, 5 AMPS (G0003552)

+24VDC

-0VDC

21 RED 18 AWG

EMERGENCY STOP PUSHBUTTON (G0005325) EMER STOP CIRCULAR LEGEND (G0007244)

ETHERNET CABLE (G0008122)

ETHERNET CABLE (G0007951)

ETHERNET SWITCH (G0007231)

ETHERNET CABLE (G0008123)

ETHERNET CABLE (G0008121)

ETHERNET CABLE (G0007952)

CONNECT SHIELD GROUNDED END OF ETHERNET CABLE AT SWITCH (MARKED W/GREEN TAPE)

THHN-18-STR-BLK

THHN-18-STR-RED

SURGE PROTECTOR (G0003504)

THHN-14-STR-BLK

THHN-14-STR-WHT

THHN-14-STR-GRN W/ YEL

32 RED

18 AWG SHIELDED

31 BLK

30 RED

AN3A BLK AN4B RED

AN4A RED

AN3B BLK

AN13A BLK

AN9A RED

25 BLK

18 AWG SHIELDED

INTRINSIC BARRIER (G0009286)

INTRINSIC BARRIER (17244-01) 5

INTRINSIC BARRIER (G0007918) 14

VIBRATION MONITOR

TOGGLE SETTINGS ON OFF OFF

SPEED SENSOR

LIQUID END

SOLID END

BLUE INTRINSIC WIRING 18AWG

GROUND SHIELDS AT THIS END ONLY

EQUIPMENT GROUND

INTRINSIC TERMINAL BLOCKS ITB1 (G0008572)(14)BLUE 2 PT (G0008544)(4)ORANGE 2 PT (G0008571)(3)GREEN 2 PT (G0008507)(2)END (G0007662)LARGE ORANGE 4 14

GROUND BUS BAR (G0005309)

INCOMING GROUND LUG (G0007213)

POWER DISTRIBUTION BLOCK (G0008889) POWER DISTRIBUTION BLOCK COVER (G0008890)(3)

FUSE 7.0 A (G0002911)

TOUCH PROOF TERMINAL COVERS (G0002873)

FUSE COVERS / PULLERS (G0002874)

115VAC

14AWG

500 VA TRANSFORMER (G0007582) 380/400VAC PRIMARY

FUSE 3-2/10A (G0001651)

FUSE 3-2/10A (G0001651)

RED

BLK

TERMINAL BLOCK (G0008891) (G0008892) (G0008893)(4)

TERMINAL BLOCK (G0008891) (G0008892) (G0008893)(4)

TERMINAL BLOCK (G0008891) (G0008892) (G0008893)(4)

NON-INTRINSIC TERMINAL BLOCKS TB2 (G0009324)(6)GREY 4 PT (G0008562)ORANGE 4 PT (G0008563)GREEN 4 PT (G0008507)(2)END 4

BOWL VFD PIN 28 BLK

BOWL VFD PIN 29 BLUE

BLACK

SPARE

1" NPT (SHPP100)

CORD FITTING BY OTHERS

POWER CABLE XP SIZED FOR 27A MAX-PROVIDED BY OTHERS

1 1/2" NPT CORD FITTING (G0008809)

CABLE ASSY (4C-#4AWG) (G0012463) 4

1 1/2" NPT CORD FITTING (G0001686)

CABLE ASSY (4C-#4AWG) (G0012462) 4

XP REDUCER 2"NPT-1½"NPT (G0012559) 4

1" NPT (SHPP100)

SPARE 2

1" NPT (SHPP100)

1/2" NPT CORD FITTING (G0001687)

INTRINSICALLY RATED CABLE 18C-18GA 4

CONTROL CIRCUIT JUNCTION BOX

(16584-01-005) 4 6

PUMP SIZED FOR MAXIMUM 11KW/15 HP 27 FLA

PUMP MOTOR 15 HP/11 KW 380 VAC 50 Hz 3 PH

PUMP AND MOTOR PROVDED BY OTHERS

CONVEYOR MOTOR 11 KW 380 VAC 50 Hz 3 PH (G0009597) 4 6

BOWL MOTOR 37 KW 380 VAC 50 Hz 3 PH (G0009596) 4 6

PUMP RESTART REMOTE N.O. CONTACT (BY OTHERS) WHEN CLOSED AND PROGRAMMED PUMP WILL RESTART (IF PUMP WAS RUNNING)

PUMP ENABLE REMOTE N.O. CONTACT (BY OTHERS) WHEN CLOSED AND PROGRAMMED PUMP IS ENABLED TO RUN

4 NOTE:
CABINET IS SHIPPED WITH TERMINALS 3 AND 4 JUMPERED TO BE REMOVED BY CUSTOMER IF REMOTE PUMP ENABLE IS USED

DO NOT PLACE JUMPER BETWEEN TERMINALS 1 AND 2 AS PUMP MAY START UNINTENTIONALLY

THESE TERMINALS ARE NOT INTENDED FOR INTRINSICALLY SAFE CIRCUITS CONTACT DERRICK CORPORATION IF REMOTE PUMP START/STOP CONTACTS ARE TO BE LOCATED IN A HAZARDOUS AREA

VIBRATION SWITCH (G0007015 SWITCH) (G0007163 CABLE)

SPEED SENSOR (G0007861 SENSOR) (G0007862 CABLE)

TEMPERATURE SENSOR LIQUID END (G0008090)

TEMPERATURE SENSOR SOLID END (G0008089)

2/0-4/C XP CABLE ASSY (G0012459) 3

2-1/2" NPT CORD FITTING (G0008964) 4

CENTRIFUGE POWER JUNCTION BOX

XP ENCLOSURE ASSY (16622-01-004)

INTRINSIC BARRIER (G0009286) 5

SET TO NO, WB-OFF, SC-OFF

160 AMP CONTACTOR (AC1) (G0008789)

FUSE 1.25 A (G0002926)

FUSE-6/10 A (G0003996)

115VAC

380VAC

100 VA TRANSFORMER (G0002482)

FUSE 6/10 A (G0003996)

THHN/THWN -14 AWG GROUND LUG (G0008896)

2" NPT WITH PLUG (SHPP200)

XP CABLE ASSY W/ XP CABLE GLAND (20AWG-2C SHIELDED) (17382-01) 4

SUPPLY 380/400 VOLTS 3 PH 50 HZ 150 AMP SERVICE BASED ON CONNECTED LOAD OF 118 AMP MAIN POWER DISCONNECT SUPPLIED BY CUSTOMER

RECOMMENDED CABLE HOOK-UP
QTY (1) COPPER COND PER PHASE SIZED FOR 150 AMP AT 75C TEMP RISE AND 40C AMBIENT
USE XP SEALING GLAND FOR A 2" NPT ENTRY

MAX 30 AMP OUTPUT

MAX 37 AMP OUTPUT

MAX 72 AMP OUTPUT

FUSE HOLDER (G0008073)

FUSES 60 AMP (G0012311)(2) 4

THHN-8-STR-BLK DC BUS WIRE THHN-8-STR-WHT 4

DC+ DC-

4 REVISION 4 STARTED USING ON DE-1000 UNIT# CF1240-X

6 5 REVISION 5 STARTED USING ON DE-1000 UNIT# CF1331-X

10 REVISION 10 STARTED USING ON DE-1000 UNIT# CF1415

14 REVISION 14 STARTED USING ON DE-1000 UNIT# CFxxxx

REF. G.A. # 14738-00-006
REF. P.L. # 16545-00-004 6
REF. ELP # 16615-00

REV	CHANGE	CKD	DATE
14	ADD WIRE NUMBERS 4,10,12,13 & 22,ADD WIRE LABELS AT JUNCTION BOX 16584-01-005 RELABEL V1-V1 TO VS1-VS2,REVISE REDUCER AT BOWL MOTOR (WAS CRH-RE-64)	JWC JFS	
13	REVISE CIRCUIT FEEDING AIR CONDITIONER-NOW USES 24VDC (WAS 230VAC) & WIRE COLOR REVISE GROUND BAR (WAS G0007610), ADD NOTE,REVISE END STOPS (WAS G0007012)	JWC JFS	03/08/12
12	REVISE POWER INCOMING CABLE TO ASSEMBLY (WAS G0008785 & G0007866), REVISE BOWL CABLE TO ASSEMBLY (WAS G0008066 AND G0007154),	JWC DSD	02/01/12
11	REVISE CONVEYOR CABLE TO ASSEMBLY (WAS G0008067 & G0008068)	DSD JWC	03/10/11
10	REVISE PURGE CABLE TO ASSY (WAS G0007956), REVISE CONDENSOR FAN TO CABLE ASSY (WAS 11881-01-025), ADD RELIEF VALVE AND PARTS, REVISE TERMINAL BLOCKS	JWC JFS	06/08/12
9	REVISE HMI TO PROGRAMMED PART (WAS G0008825)	JWC JFS	

REV	CHANGE	CKD	DATE
12	REV DC BUS FUSE/HOLDER (WAS G0007585(2) AND G0007623(2)), REV DC- WIRE TO WHT REVISE WIRING TO TEMPERATURE SENSOR, REVISE TEMPERATURE SENSOR (WAS G0009973)	JWC JFS	10/14/11
11	REVISE JUNCTION BOX TERMINALS TO MATCH 16584-00-005 AND INTERNAL TERMINALS	JWC JFS	09/15/11
10	ADD RTD (G0009973) AND WIRING, REVISE CONDUCTOR SIZES, ADD CONNECTED LOAD INFO REVISE TITLE BLOCK FROM XP TO FP	JWC DSD	05/27/11
9	CHANGED REF. NUM. (WAS 16584-00) & TERMINAL BLOCK WIRING IN 16584-01-005 & B. SPARE CONNECTIONS WERE TERMINALS 1 & 2, V1 - SE2 WERE TERMINALS 3 THROUGH 12.	JWC DSD	03/10/11
8	REVISE INTRINSIC BARRIER FOR CAST BOX AND VIBRATION MONITOR (WAS G0008526)	JWC JFS	12/20/10

REV	CHANGE	CKD	DATE
7	ADD LARGE ORANGE BARRIER (G0007662), OMIT TWO SPARE TERMINALS IN JUNCTION BOX (16584-00)	JWC JFS	08/13/10
6	REVISE ELP DRAWING NUMBER (WAS 16615-00-001), ADD UNIT NUMBER USED ON REV 5 REVISE BOWL MOTOR (WAS G0009227) AND CONVEYOR MOTOR (WAS G0009222)	JWC JFS	06/30/10
5	REVISE ALL INTRINSIC BARRIERS (WERE SPEED-G0007234, TEMP-G0007233 AND DIGITAL-G0007232), REVISE 2-1/2" CORD FITTING (WAS G0008799)	JWC JFS	10/07/09
4	REVISE BOWL MOTOR (WAS G0002325), REVISE CONVEYOR MOTOR (WAS G0008888), ADD REMOTE PUMP START SIGNAL INTO BOWL DRIVE DIGITAL INPUT @ PIN 28, ADDED 2	JWC MJS	09/04/09
3	ADDITIONAL TERMINAL BLOCKS FOR REMOTE PUMP START SIGNAL AND 24VDC RETURN AND ADDED WARNING NOTE ABOUT INTRINSIC WIRING, CHANGE INTRINSIC CABLE (WAS G0008075)	JWC MJS	09/04/09

REV	CHANGE	CKD	DATE
3	REVISE POWER WIRING TO ETHERNET SWITCH, ADD NOTE BY ETHERNET SWITCH	JWC JFS	06/17/09
2	CHANGED HMI TO 120 VAC (WAS G0007245), CHANGED COND FAN HOLE TO 3/4 (WAS 1/2) CHANGED FITTING (WAS G0008803), ADD SPARE 1" HOLE, ADD PUMP ENABLE CIRCUIT	JWC JFS	12/09/08
1	CHANGED G000 NUMBER SECONDARY FUSE ON 100 VA CONTROL TRANSFORMER (WAS G0002303)	JWC JFS	09/11/08
REV	CHANGE	CKD	DATE

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TITLE: VFD FP DE-1000 CENTRIFUGE ELECTRICAL WIRING SCHEMATIC 380/400V 50HZ

DWN BMB CKD JFS DATE 02/07/03 SCALE NONE REV 15

DWN JWC 07/02/08 CKD JFS 08/26/08

SHEET SIZE D FSC N

DRAWING NO. 14394-00-017

DERRICK CORPORATION 590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

CENTIMAN

CONDENSER FAN MOTOR
0.5HP-1.1A
460 VAC
60 Hz 3 PH
0.5HP MOTOR (G0007588)
3/4"NPT ELBOW 90° (CRH-EL296)
XP CABLE ASSY (16AWG-6C) W/ XP GLAND (G0009767) 4
3/4" NPT CORD FITTING (TBS2535)

PURGE SYSTEM (G0007865)
I.S. SWITCH
+ BLU
2 CLR
1/2" NPT CORD FITTING (G0004418)
TUBE (G0009864) 4
ELBOW (G0009863)
RELIEF VALVE (G0008006) 15

FEED PUMP INPUT FUSES
FUSE HOLDER (G0003486)(3)
FUSES-40 AMP (G0003484)(3)
40 AMP
FUSE HOLDER (G0007585)(3)
FUSES-100 AMP (G0007583)(3)
100 AMP
CENTRIFUGE BOWL INPUT FUSES
FUSE HOLDER (G0007214)
FUSES-15 AMP (G0003493)(3)
15 AMP
AIR CONDITIONER INPUT FUSES
FUSE HOLDER (G0007214)
FUSES-3.0 AMP (G0008792)(3)
3.0 AMP

AIR CONDITIONER (G0002881)
T1 THERMOSTAT INPUT CONTROL 24 VAC
X3
THHN-14-STR-BLK AD3-L1 AD3-L2 14AWG GRD
THHN-18 AWG 4

(G0009974 SENSOR) (G0009972 CABLE) 4
TEMP RTD SENSOR 4-20MA OUTPUT
22 AWG-2C-WHITE
1 AWG-2C-BROWN
THHN-4-STR-BLK 4

CONVEYOR CONTROLLER 20HP (G0007241)
INVERTER
OUTPUT COM TO AC
DIGITAL OUT
TEMP RTD COM OVDV
TEMP RTD INPUT 4-20MA
AC PRESSURE FAILURE
AC COMP MTR OL
AC EVAP BLWR MTR OL
24VDC
1 RED
25 BLK
15 BLK
16 RED
A/C PRESSURE FAILURE
A/C COMPRESSOR MOTOR OVERLOAD
A/C EVAPORATOR BLOWER MOTOR OVERLOAD
18 AWG RED

FEED PUMP CONTROLLER 15HP (G0008360)
INVERTER
SPEED SENSOR 4-20MA 2+
AN13A BLK
AN9A RED
PUMP ENABLE 29
E-STOP-32
VB MON-31
SPEED SENSOR-30
COM-25
RJ45
MAX 27 AMP OUTPUT
MAX 34 AMP OUTPUT
FUSE HOLDER (G0008073)
FUSES 60 AMP (G0012311)(2) 4
AN3B BLK
AN4B RED
25 BLK
10 AWG

BOWL CONTROLLER 50HP (G0008359)
INVERTER
PUMP RESTART-28
E-STOP-32
VB MON-31
SPEED SENSOR-30
TEMP SENSOR LIQUID 1-4-20MA 2+
AN1A BLK
AN4A RED
COM-25
25 BLK
RJ45
MAX 77 AMP OUTPUT
THHN-8-STR-BLK DC+
D.C. BUS WIRE DC-
THHN-8-STR-WHT
ETHERNET CABLE (G0008123)
ETHERNET CABLE (G0008121)
ETHERNET CABLE (G0007952)

CONNECT SHIELD GROUNDED END OF ETHERNET CABLE AT SWITCH (MARKED W/GREEN TAPE)
ETHERNET SWITCH (G0007231) 3
ETHERNET CABLE (G0008122)
ETHERNET CABLE (G0007951)
+24VDC
0VDC
THHN-18 AWG

PLC (G0007228) BATTERY (G0008349) ETHERNET MEMORY CARD COMPACTFLASH (G0007995)
POWER SUPPLY 120 V 2 A (G0007229)
END BARRIER (G0007230)
120VAC
BLK
WHT
L1
N
THHN-14 AWG

ETHERNET RJ45 HMI (G0007976)
USB/PS2 ASSY (17006-02) 2,12
MOUSE/POINTER ASSY (17006-01)
1 RED
RED 18 AWG
+24VDC POWER SUPPLY 24 VDC, 4 AMPS (G0003552)
0VDC
25 BLK
THHN-14-STR-BLK
THHN-14-STR-WHT
THHN-14-STR-GRN
SURGE PROTECTOR (G0003504)
14AWG

EMERGENCY STOP PUSHBUTTON (G0005325)
EMER STOP CIRCULAR LEGEND (G0007244)
21
22
32

THHN-14-STR-BLK
THHN-14-STR-WHT
FUSE 7.0 A (G0002911)
TOUCH PROOF TERMINAL COVERS (G0002873)
120VAC
FUSE COVERS / PULLERS (G0002874)
480VAC
500 VA TRANSFORMER (G0003494) 480VAC
THHN-14-STR-BLK
FUSE 2.5 A (G0002910)
FUSE 2.5 A (G0002910)
RED
BLK

25 BLK
AN13A BLK
AN9A RED
32 RED
31 BLK
30 RED
18 AWG SHIELDED
+24VDC
0VDC
AN3A BLK
AN4A RED
AN3B BLK
AN4B RED

NON-INTRINSIC TERMINAL BLOCKS TB2 (G0009324)GREEN 4 PT (G0008562)Y7) GREY 4 PT (G0008563)ORANGE 4 PT (G0008507)X2) END 4
TERMINAL BLOCK (G0008891) (G0008892) (G0008893)(4)
GRD
18 AWG
BLK
+24VDC RED
0VDC BLACK
SPARE

INTRINSIC BARRIER (G0009286) 10
VIBRATION MONITOR
INTRINSIC BARRIER (17244-01) 10
TOGGLE SETTINGS NO OFF OFF
SPEED SENSOR
INTRINSIC BARRIER (G0007918) 4
LIQUID END
SOLID END
BLUE INTRINSIC WIRING 18AWG

GROUND SHIELDS AT THIS END ONLY
GROUND SHIELDS THIS END ONLY
SHLD GRD
EQUIPMENT GROUND
SPARE SPARE VS1 VS2 SP5 SP6 LE3 LE1 LE2 SE3 SE1 SE2

INTRINSIC TERMINAL BLOCKS ITB1 (G0008572)(14)BLUE (G0008544)(4)ORANGE (G0008571)(3)GREEN (G0008507)(2)END (G0007662)LARGE ORANGE 4

GROUND BUS BAR (G0005309) 4
INCOMING GROUND LUG (G0007213)
POWER DISTRIBUTION BLOCK (G0008889) POWER DISTRIBUTION BLOCK (G0008890)(3) COVER

1" NPT
1" NPT PLUG (SHPP-100)
CORD FITTING BY OTHERS
POWER CABLE XP SIZED FOR 27A MAX-PROVIDED BY OTHERS
PUMP SIZED FOR MAXIMUM 15HP/27FLA
PUMP MOTOR 15HP-21A 460 VAC 60 Hz 3 PH
PUMP AND MOTOR PROVIDED BY OTHERS

1 1/2" NPT CORD FITTING (G0008809) 1
CABLE ASSY (4C-#8AWG) (G0012463) 13
CONVEYOR MOTOR 20HP-27A 460 VAC 60 Hz 3 PH
CONVEYOR MOTOR (G0009597) 4,7

1 1/2" NPT CORD FITTING (G0001686) 1
CABLE ASSY (4C-#4AWG) (G0012462) 13
XP REDUCER 2"NPT-1½"NPT (G0012559) 4
BOWL MOTOR 50HP-65A 460 VAC 60 Hz 3 PH
BOWL MOTOR (G0009596) 4,7

1" NPT PLUG (SHPP-100) 4
PUMP RESTART REMOTE N.O. CONTACT (BY OTHERS) WHEN CLOSED AND PROGRAMMED PUMP WILL RESTART (IF PUMP WAS RUNNING)
PUMP ENABLE REMOTE N.O. CONTACT (BY OTHERS) WHEN CLOSED AND PROGRAMMED PUMP IS ENABLED TO RUN

NOTE:
CABINET IS SHIPPED WITH TERMINALS 3 AND 4 JUMPERED TO BE REMOVED BY CUSTOMER IF REMOTE PUMP ENABLE IS USED

DO NOT PLACE JUMPER BETWEEN TERMINALS 1 AND 2 AS PUMP MAY START UNINTENTIONALLY

THESE TERMINALS ARE NOT INTENDED FOR INTRINSICALLY SAFE CIRCUITS CONTACT DERRICK CORPORATION IF REMOTE PUMP START/STOP CONTACTS ARE TO BE LOCATED IN A HAZARDOUS AREA

SPARE
1" NPT PLUG (SHPP-100)

INTRINSICALLY RATED SHIELDED CABLE 18AWG-18CU (G0008403)
1/2" NPT CORD FITTING (G0001687)
CONTROL CIRCUIT JUNCTION BOX (16584-01-005) 9
VIBRATION SWITCH (G0003015 SWITCH) (G0007763 CABLE)
SPEED SENSOR (G0007861 SENSOR) (G0007862 CABLE)
TEMPERATURE SENSOR LIQUID END (G0008090)
TEMPERATURE SENSOR SOLID END (G0008089)

1/0-4/C XP CABLE (G0012460) 4
2-1/2" NPT CORD FITTING (G0009811) 4
CENTRIFUGE POWER JUNCTION BOX
XP ENCLOSURE ASSY (16622-01-005)
INTRINSIC BARRIER (G0009286) 10
SET TO NO, WX-OFF, SC-OFF
xp CABLE ASSY (20AWG-8C) W/XP GLAND (17382-01) 4,5
12100 AMP CONTACTOR (AC1) (G0008060) 4
THHN/THWN -14 AWG
FUSE 1.25 A (G0002926)
FUSE-0.5 A (G0004195) 480VAC
120VAC
100 VA TRANSFORMER (G0002481) 4,7
THHN/THWN -14 AWG GROUND LUG (G0008896) 4
2" NPT PLUG (SHPP-200)

SUPPLY 480 VOLTS 3 PH 60 HZ
RECOMMEND 125 AMP SERVICE
BASED ON CONNECTED LOAD OF 100 AMP
MAIN POWER DISCONNECT SUPPLIED BY CUSTOMER 4,10

RECOMMENDED CABLE HOOK-UP
QTY (1) COPPER COND PER PHASE SIZED FOR 125 AMP AT 75C TEMP RISE AND 40C AMBIENT
USE XP SEALING GLAND FOR A 2" NPT 5,6,10

REVISION 4 STARTED USING ON DE-1000 UNIT# CF1240-X 4
REVISION 10 STARTED USING ON DE-1000 UNIT# CF1415 10
REVISION 14 STARTED USING ON DE-1000 UNIT# CFxxxx 14
REF. G.A. # 14738-00-007 2
REF. P.L. # 16545-00-002
REF. ELP # 16615-00 6

REV	CHANGE	CKD	DATE
15	ADD RELIEF VALVE, REVISE COND FAN CABLE ASSY, REVISE PURGE INTRINSIC CABLE ASSY	JWC	06/08/12
14	REVISE REDUCER AT BOWL MOTOR (WAS CRH-RE-64)		
	REVISE END STOPS TO G0008507 (WAS G0007012), ADD WIRE NUMBERS 4, 10,12,13 & 22 ADD WIRE LABELS AT JUNCTION BOX 16584-01-005, OMIT TWO SPARE TERMINALS		

REV	CHANGE	CKD	DATE
14	REVISE CIRCUIT FEEDING AIR CONDITIONER-NOW USES 24VDC (WAS 230VAC) & WIRE COLOR REVISE GROUND BAR(WAS G0007610), ADD NOTE, RELABEL V1-V2 TO VS1-VS2	JWC	03/12/12
13	REFER TO PAPER SPACE FOR REVISIONS 1-12, REVISE POWER INCOMING CABLE TO ASSEMBLY (WAS G0007867 & G0007866), REVISE BOWL CABLE TO ASSEMBLY (WAS G0008066 AND G0007154), REVISE CONVEYOR CABLE TO ASSEMBLY (WAS G0008067 & G0008068)	JWC	02/01/12

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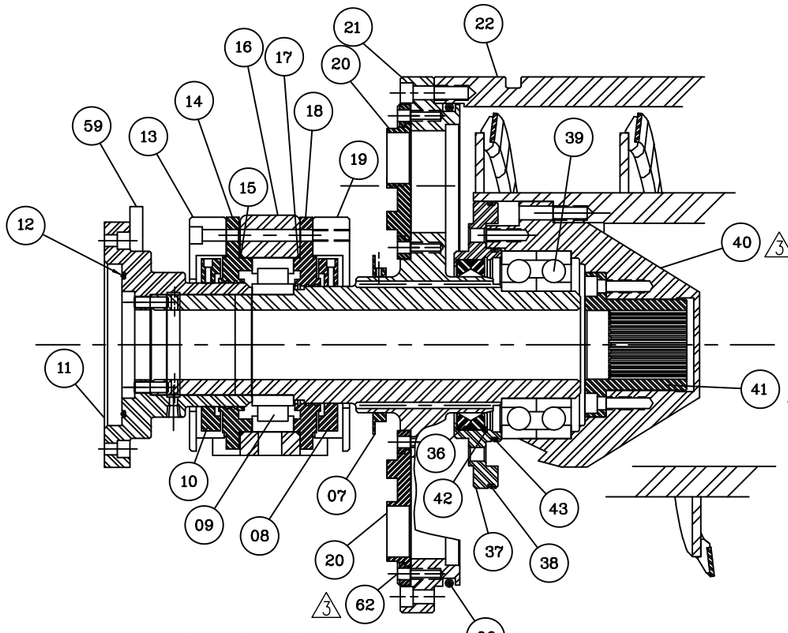
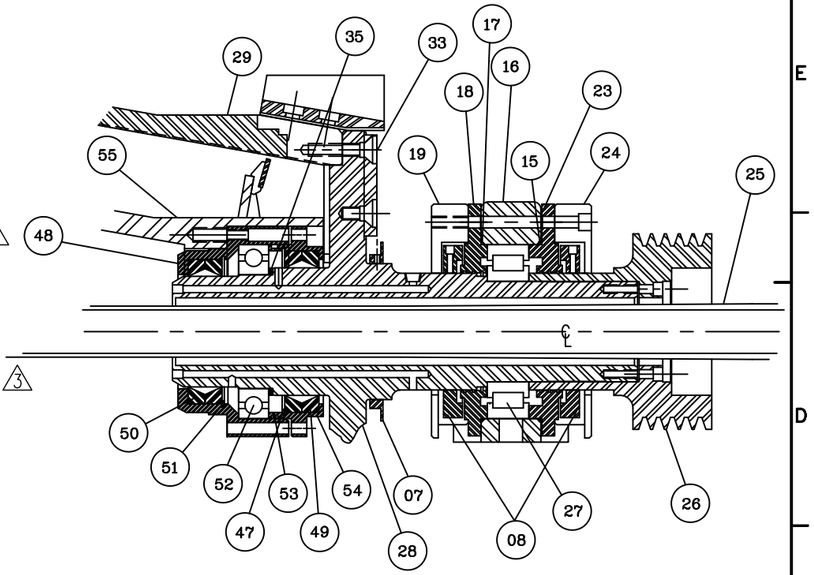
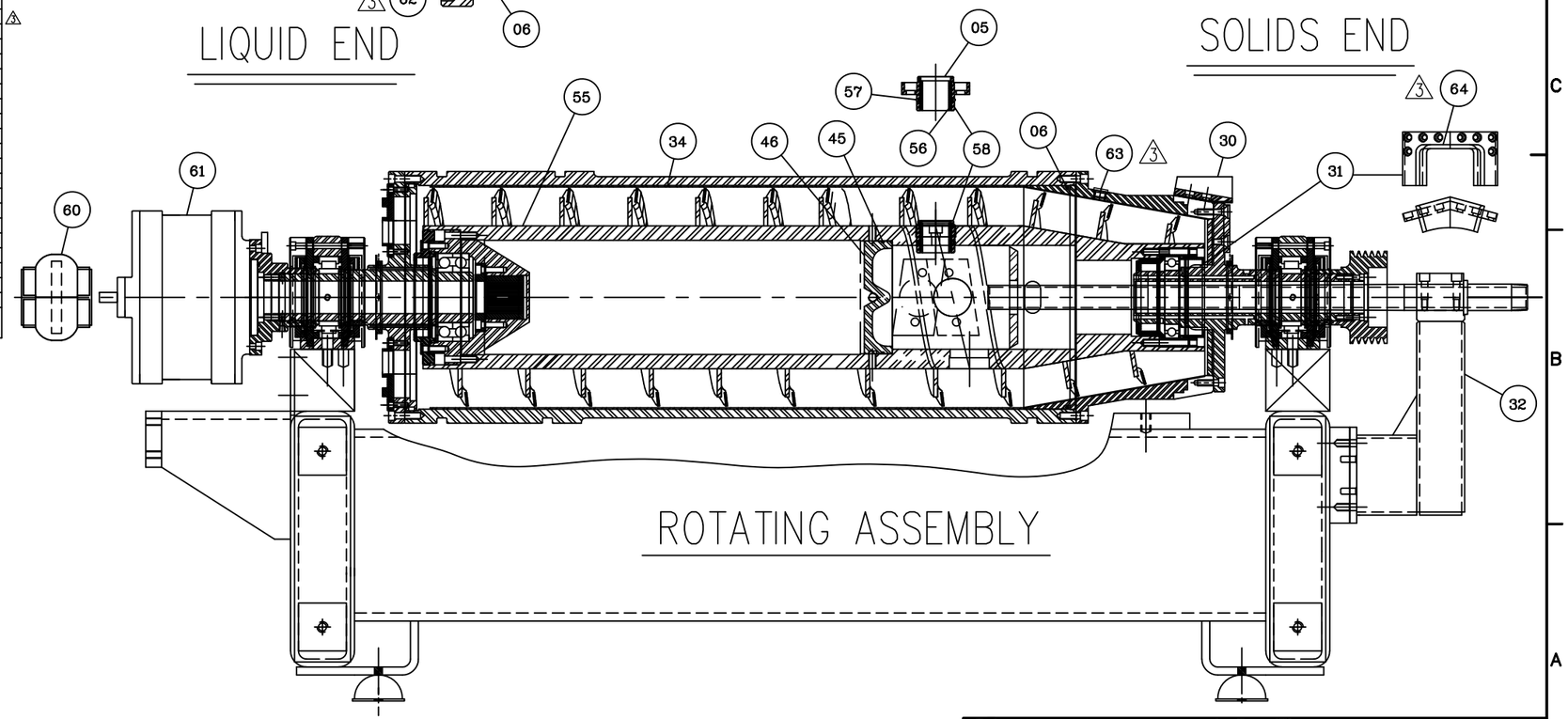
TITLE: VFD XP DE-1000™ CENTRIFUGE
ELECTRICAL WIRING SCHEMATIC 460/480V 60 HZ
DWN BMB CKD JFS DATE 02/07/03 SCALE NONE REV 15
SHEET SIZE D DRAWING NO. 14394-00-018
DWN JFS 08/20/08 CKD JWC 08/20/08
DERRICK® CORPORATION 590 DUKE ROAD BUFFALO, NY 14225 U.S.A.
CENT_MAN

					1	1	64	O-RING STOCK	70D-NIT-CORD-21
					1	1	63	HEX PLUG	PKR-8-HP50N-SS
W	C				4	4	62	MOUNTING RING	**10888-02**
					1	1	61	GEARBOX	**13223-22**
					1	1	60	COUPLING	G0008125
					2	2	59	SPEED SENSOR TAB	**10889-01**
	B	1					58	FEED NOZZLE - CASTING	**9524-03**
	B	1					57	O-RING 227 **(9524-02)**	CS10-RA-324-00
W	B	1					56	CARBIDE INSERT **(9524-01)**	CS10-RA-629-TC
	B		1				55	4 1/4" SINGLE LEAD CONVEYOR	**9562-01-007**
	B		1	1			54	SEAL HOUSING S/E	**9533-00**
	B		1	1			53	O-RING 249	CS10-RA-325-00
	B		1	1			52	BALL BEARING 6017	CS10-RA-511-00
	B		1	1			51	RETAINER RING RR425	CS10-RA-327-00
	B		2	2			50	SEAL (GARLOCK 24600-7374)	CS10-RA-310-00
	B		2	2			49	SEAL (GARLOCK 24600-2462)	CS10-RA-311-00
	B		1	1			48	BEARING HOUSING S/E	**9553-00**
	B		1	1			47	RETAINER RING RR475	CS10-RA-328-00
W	B		1	1			46	FEED ACCELERATOR BUMP	**9537-00**
	B		1	1			45	O-RING 261	CS10-RA-323-00
	B			1			44	4 1/4" SINGLE LEAD CONVEYOR	**9562-01-005**
	B		1	1			43	O-RING 252	CS10-RA-322-00
	B		1	1			42	RETAINING RING RR500	CS10-RA-326-00
	B		1	1			41	SPLINE HUB	**9519-00**
	B		1	1			40	BEARING HOUSING L/E	**9521-00**
	B		2	2			39	THRUST BEARING 7216	CS10-RA-510-00
	B		1	1			38	O-RING 266	CS10-RA-321-00
	B		1	1			37	SEAL HOUSING L/E	**9531-00**
	B		2	2			36	SEAL (GARLOCK 24600-0978)	CS10-RA-312-00
					1	1	35	WAVE SPRING	G0004365
W	A				1	1	34	BOWL LINER	**9502-00**
W	D				1	1	33	BOWL HEAD PLOW **(10579-00)**	CS10-RA-650-IC *
	E				1	1	32	FEED TUBE SUPPORT	**9539-01**
W	A				1	1	31	SOLIDS DISCH. WEAR INSERTS **(9547-00)**	CS10-RA-630-IC *
W	A				1	1	30	BOWL EXTENSION PLOW	**9502-00**
	A				1	1	29	BOWL EXTENSION	**9402-00**
	D				1	1	28	SOLID BOWL HEAD	**9403-00**
	D				1	1	27	BEARING NUP-2215	CS10-RA-512-00
	D				1	1	26	PULLEY SHEAVE 5.75" PD	**9546-00**
	E				1	1	25	FEED PIPE	**9540-00**
	D,C				1	1	24	FLINGER COVER (OUTBOARD)	**9670-00**
	D,C				1	1	23	PILLOW BLOCK COVER (OUTBOARD)	**9568-00**
	A				1	1	22	BOWL	**9525-00**
	C				1	1	21	LIQUID BOWL HEAD	**9505-00-001**
W	C				4	4	20	EFFLUENT PORTS	**10888-01**
	D,C				2	2	19	FLINGER COVER (INBOARD)	**9617-00**
	D,C				2	2	18	PILLOW BLOCK COVER (INBOARD)	**9512-00**
	D,C				2	2	17	O-RING (4.989 ID X .070)	G0003212
	D,C				2	2	16	PILLOW BLOCK	9545-00-002
	D,C				2	2	15	O-RING (4.987 ID X .103)	G0003211
	D,C				1	1	14	PILLOW BLOCK COVER (OUTBOARD FLANGE SIDE)	**9568-00-002**
	D,C				1	1	13	FLINGER COVER (OUTBOARD FLANGE SIDE)	**9670-00-001**
	C				1	1	12	O-RING (4.000 ID X .125)	ORVI-ARP-242
	C				1	1	11	GEAR FLANGE	**9522-00-001**
	D,C				1	1	10	PILLOW BLOCK FLINGER (OUTBOARD FLANGE SIDE)	**9514-00-001**
	C				1	1	09	BEARING NU 2215	CS10-RA-513-00
	D,C				3	3	08	PILLOW BLOCK FLINGER	**9514-00**
	D,C				2	2	07	CASE FLINGER	**9515-00**
	A				2	2	06	O-RING 456	CS10-RA-316-00
W	B		4	4			05	FEED NOZZLE ASSY.	**9524-00**
					1		04	CONVEYOR ASSY W/ HARD SURFACING	
						1	03	CONVEYOR ASSY W/ TILES	
							02	COMPLETE ROTATING ASSY W/ H.S.	
	B						01	COMPLETE ROTATING ASSY W/ TILES	
WEAR ITEMS	ASSY. REF.	QTY			ITEM#	DESCRIPTION	DWG. NO.		

△3 *- COMPLETE SET







REV	CHANGE	DR	DATE
△3	REVERSED ITEMS 41 & 40 POINTING TO WRONG PARTS. ADDED ITEMS 63, 63 & 64. REVISED WDI TO ADD ITEM 63. CHANGED PER ERR 2496, ADDED NOTE, ITEM 35 WAS 9568-00	KW	12/6/11
△2	ADDED ITEM 61.	CCS	12/15/09
△1	ITEM 55 WAS 9562-00-002, ITEM 44 WAS 9562-00, UPDATED VIEWS	LJB CCS	8/26/08

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TITLE: CENTRIFUGE - ROTATING ASSEMBLY FOR DERRICK® DE-1000™ (RADIAL FLOW)

DWN KW CHD TS DATE 2/24/92 SCALE 1=4,1=2 REV △3

DWN DRC 6/1/07

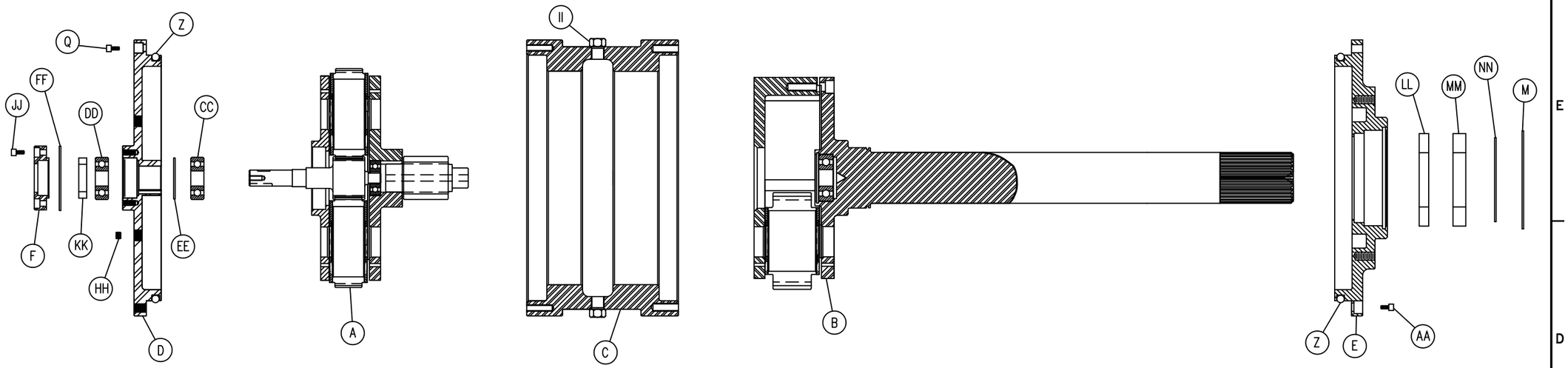
CHD CCS 6/4/07

SHEET SIZE D | Y | FC

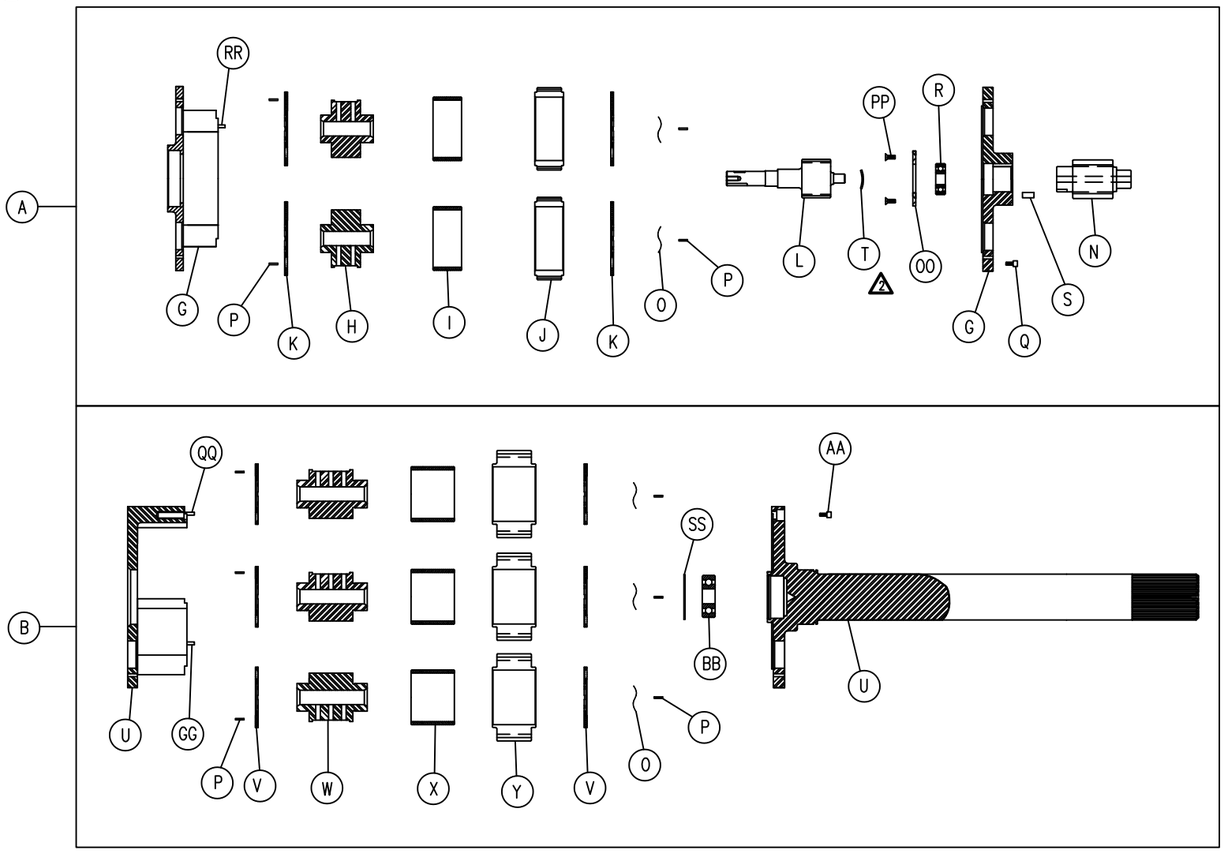
DRAWING NO. 9587-00-005

DERRICK® CORPORATION 590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

REF 14738-00-004



1	1			SS	RETAINING RING	CS10-GU-319-00
		2		RR	DOWEL PIN	PP1361
	2			QQ	DOWEL PIN	PP1362
		2		PP	MACHINE SCREW	G0003040
		1		OO	RETAINER PLATE	**11033-00**
			1	NN	RETAINING RING	CS10-GU-318-00
			1	MM	SHELL REAR COVER BEARING	CS10-GU-508-00
			1	LL	SHELL REAR COVER SEAL	SEAL-0287-03631
			1	KK	SHELL FRONT COVER SEAL	CS10-GU-308-00
			4	JJ	HEX HEAD CAP SCREW	HXCS-10-24X75-8
			2	II	PLUG w/O-RING	IMP-721FSO-5
			2	HH	PIPE PLUG	SHPP-13
1	1			GG	DOWEL PIN	PP1354
			1	FF	SEAL HOUSING GASKET	**11373-00**
			1	EE	BEARING SPACER RING	**11374-00**
			1	DD	FIRST STAGE SUN GEAR BEARING	CS10-GU-505-00
			1	CC	BEARING - FIRST STAGE	CS10-GU-507-00
	1			BB	BEARING - SECOND STAGE	CS10-GU-506-00
	9		8	AA	HEX HEAD CAP SCREW	HXCS-31-18X75-8
			2	Z	O-RING	CS10-GU-309-00
	3			Y	SECOND STAGE PLANET GEAR	**11099-00**
	3			X	SECOND STAGE JOURNAL BUSHING	**11353-02**
	3			W	SECOND STAGE JOURNAL	**10988-00**
	6			V	SECOND STAGE THRUST WASHER	**11028-00**
1	1			U	CAGE AND CARRIER - SECOND STAGE	**13297008**
2 1		1		T	BELVILLE WASHER	PP1364
		1		S	KEY - 1/4 X 1/2	**11375-00**
		1		R	FIRST STAGE INNER BEARING	CS10-GU-503-00
		8	8	Q	HEX HEAD CAP SCREW	HXCS-25-20X63-8
	6	4		P	DOWEL PIN	PP1365
	3	2		O	WAVEY SPRING WASHER	PP1363
		1		N	SECOND STAGE SUN GEAR	**11101-00**
			1	M	RETAINING RING	CS10-GU-317-00
		1		L	FIRST STAGE SUN GEAR	**11100-00**
		4		K	FIRST STAGE THRUST WASHER	**10996-00**
		2		J	FIRST STAGE PLANET GEAR	**11098-00**
		2		I	FIRST STAGE JOURNAL BUSHING	**11353-01**
		2		H	FIRST STAGE JOURNAL	**10987-00**
		1		G	CAGE AND CARRIER - FIRST STAGE	**13299008**
			1	F	SEAL HOUSING	**11029-00**
			1	E	SHELL REAR COVER	**10905-00**
			1	D	SHELL FRONT COVER	**10986-00**
			1	C	SHELL	**10995-00**
			1	B	COMPLETE STAGE TWO ASSY	
			1	A	COMPLETE STAGE ONE ASSY	
			01		COMPLETE GEAR UNIT	
QTY			ITEM		DESCRIPTION	PART NUMBER



2 ITEM T QUANTITY WAS 2. MCP SDB 1/30/07
1 UPDATED DRAWING NUMBERS. NVB 4/3/01
REV CHANGE CKD DATE

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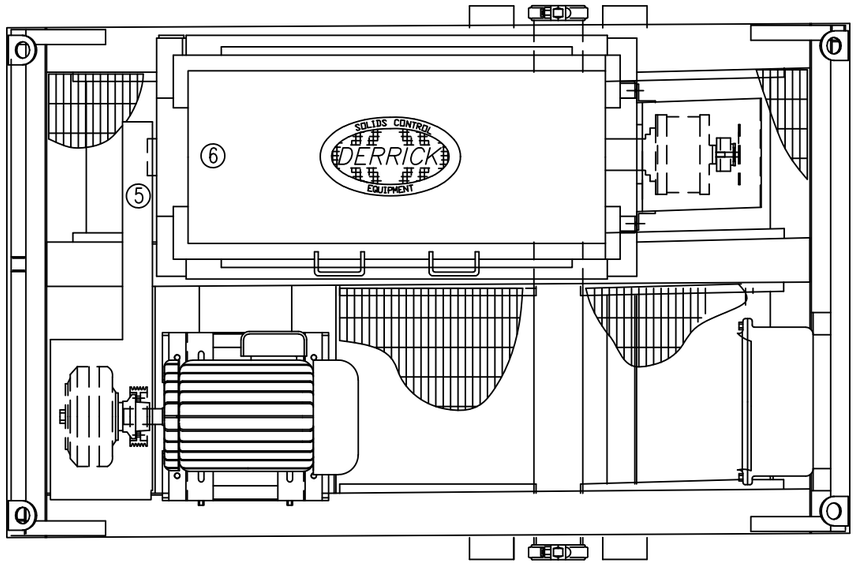
TITLE: PARTS LIST
DE-1000™ GEAR UNIT 52:1

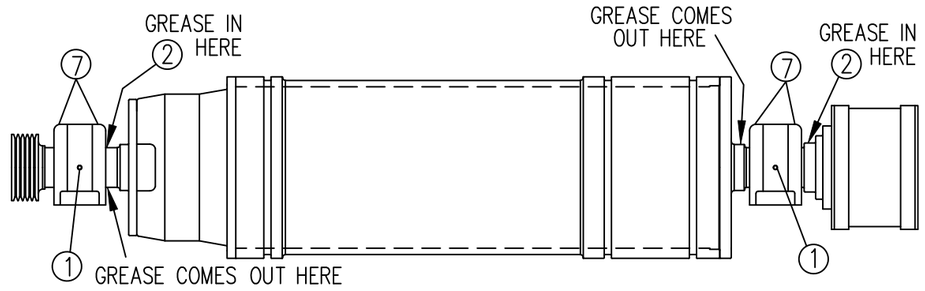
DWN WS | CKD TS | DATE 11/12/93 | SCALE NTS | REV 2
SHEET SIZE C | F C | DWN DJS 1/30/98 | CKD TOC 2/13/98
DRAWING NO. 11372-01

DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

CENT, MA, MAN

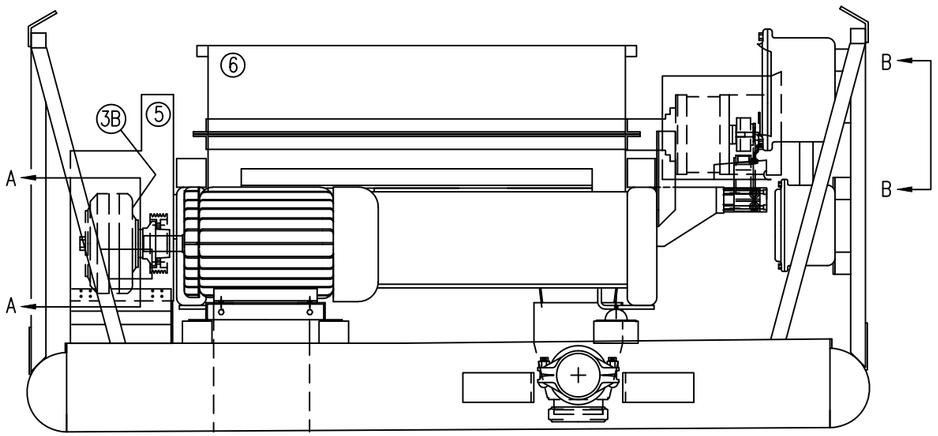


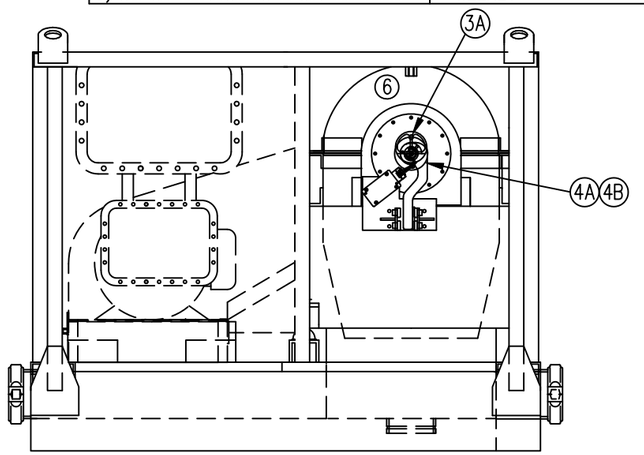
BELT DRIVE ONLY



LUBRICATION & MAINTENANCE SCHEDULE		
MAINTENANCE OPERATIONS	SERVICE INTERVAL	LUB. TYPE (OTHER)
1) GREASE MAIN BEARINGS	1 SHOT DAILY	REFER TO B 1.1
2) PURGE CONVEYOR BEARINGS	BI-WEEKLY	REFER TO B 1.1
3) CHECK FLUID LEVELS:		
A) GEAR BOX HOLE @ 12:00	BI-WEEKLY	REFER TO B 1.1
B) DRIVE CLUTCH HOLE	BI-WEEKLY	REFER TO B 1.1
4) TORQUE OUT ASSEMBLY		
A) CHECK TORQUE SETTING	250 HRS	REFER TO MANUAL
B) GREASE	1000 HRS	REFER TO MANUAL
5) CHECK BELT TENSION	BI-WEEKLY	20lbs.@ 1/2"
	INITIAL BREAK-IN	30lbs.@ 1/2"
6) CHECK CASE FOR SOLIDS	WEEKLY	VISUAL
7) CLEAN OUT UNDER FLINGER COVERS	MONTHLY	VISUAL
8) CHECK HYDRUALIC FLUID IN TANK	WEEKLY	REFER TO MANUAL

HYDRUALIC DRIVE ONLY

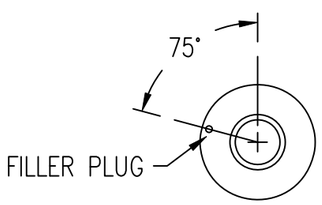




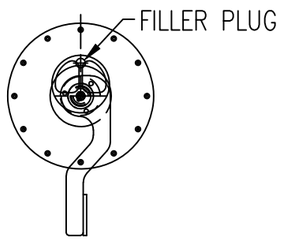
REF 10500-00

*MIXING LUBRICANTS MAY CAUSE CATASTROPHIC FAILURE

DRAIN & REPLACE ALL FLUIDS EVERY 120 DAYS OR 1800 HRS. OF USE



SECTION A-A



SECTION B-B

DWN: CK 06/27/97
CKD:

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REV	CHANGE	CKD	DATE

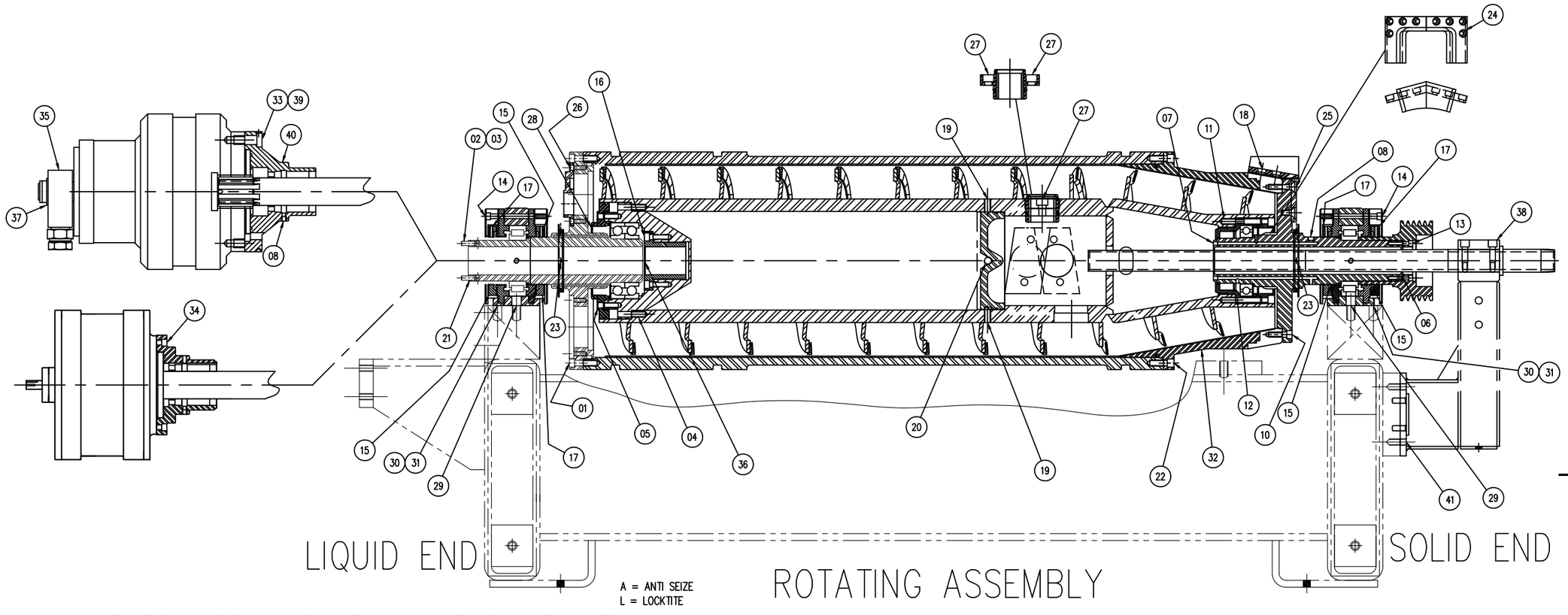
DERRICK® CORPORATION

590 DUKE ROAD — BUFFALO, NEW YORK 14225 U.S.A.

TITLE: LUBRICATION & MAINTENANCE SCHEDULE
DERRICK DE-1000™ CENTRIFUGE

DWN	CKD	DATE	SCALE
KW	TS	6-11-92	NTS

00C DB	Y FC	DRAWING NO. 10647-00-002	FIG B.1 FIGURE NO	△ REV



A = ANTI SEIZE
L = LOCKTITE

⚠4	4	41	3/8-16 X 1 1/2 (HEX HEAD BOLT)	G0008180	N/A	A	FEED TUBE SUPPORT FLANGE
⚠5	1	40	5/16-18 X 1/2 ALY (SET SCREW CUP PT)	G0004184	N/A	A	FLANGE TO KEY
⚠6⚠3 ***	6	39	M16 X 40 (HEX SOCKET ALY)	13635-38	N/A	A	ROTODIFF TO ROTODIFF FLANGE
⚠7⚠4⚠1	4	38	3/8-16 X 2 1/2 (HEX HEAD BOLT)	G0008178	NO TORQUE	A	FEED TUBE MOUNTING BLOCK
**	1	37	30 x 1.5MM X 1.4W EXTERNAL SNAP RING	G0003966	N/A	N/A	ROTODIFF PORT BLOCK
	2	36	3/8 X 1 PIN (STEEL)	PP1354	N/A	680L	SPLINE HUB
**	1	35	3MM SET (SET SCREW)	PP1134-714	N/A	A	PORT BLOCK
	6	34	5/16-18 X 3/4 (HEX SOCKET)	SKCS-31-18X075	N/A	A	GEARBOX TO GEARBOX FLANGE
⚠3⚠2 ***	6	33	M16 X 35 (HEX SOCKET ALY/PLD)	13635-37	N/A	A	ROTODIFF TO ROTODIFF FLANGE
	1	32	#8 PLUG SS	PKR-8-HP50N-SS	35 FT-LBS	A	BOWL EXTENSION
⚠6⚠4	4	31	#7 PIN (3/8-24 X 2 1/2 STEEL)	13775-00	N/A	A	PILLOW BLOCK
	4	30	#8 PIN (7/16-20 X 2 1/2 STEEL)	G0003955	N/A	A	PILLOW BLOCK
⚠7⚠5⚠4	4	29	5/8-11 X 2 1/4 (HEX HEAD BOLT)	G0008202	197 FT-LBS	A	PILLOW BLOCK
	2	28	3/8-16 X 1/2 SS (SET SCREW CUP POINT)	G0003950	N/A	A	SEAL HOUSING
	8	27	1/2-13 X 1 SS (HEX SOCKET)	G0002156	53 FT-LBS	A	FEED NOZZLE
	12	26	5/16-18 X 7/8 SS (HEX SOCKET)	G0001578	144 IN-LBS	A	EFFLUENT PORT
	4	25	3/8-16 X 3/4 SS (FLAT HEAD HEX SOCKET)	FHSK-38-16X75-S	183 IN-LBS	A	SOLID HEAD PLOWS
	32	24	5/16-18 X 3/4 SS (HEX SOCKET)	G0003059	144 IN-LBS	A	WEAR INSERTS
	4	23	10-24 X 1/4 SS (SET SCREW CUP POINT)	G0003874	N/A	A	CASE FLINGER
	12	22	3/8-16 X 1 SS (HEX SOCKET)	G0003064	252 IN-LBS	A	BOWL EXTENSION
⚠6⚠3 *	9	21	5/16-18 X 1 (HEX SOCKET ALY)	SKCS-31-18X100	300 IN-LBS	262L	ROTODIFF/GEARBOX FLANGE
	1	20	1/2-13 X 1 SS (SET SCREW FULL DOG)	G0003877	265 IN-LBS	A	FEED ACCEL BUMP
	2	19	3/8-16 X 1 SS (SET SCREW CONE POINT)	G0003876	75 IN-LBS	A	FEED ACCEL BUMP
	8	18	3/8-16 X 3/4 SS (HEX SOCKET)	G0003063	252 IN-LBS	A	CASE PLOWS
⚠7⚠6	4	17	1/4-20 X 5/8 (HEX SOCKET SST)	G0008201	144 IN-LBS	A	PILLOW BLOCK FLINGER
	8	16	3/8-16 X 1 SS (HEX SOCKET)	G0003064	252 IN-LBS	A	SPLINE HUB
	16	15	3/8-16 X 1 SS (FLAT HEAD HEX SOCKET)	G0001868	183 IN-LBS	A	PILLOW BLOCK COVER
⚠7⚠4	6	14	5/16-18 X 4 (HEX SOCKET SST)	G0008200	NO TORQUE	A	FLINGER COVER
	8	13	1/4-20 X 1 SS (HEX SOCKET)	G0003056	83 IN-LBS	A	PULLEY SHEAVE
	1	12	1/4 X 1 PIN (STEEL)	PP1361	N/A	680L	S/E BEARING HOUSING
	6	11	5/16-18 X 3 SS (HEX SOCKET)	G0003062	144 IN-LBS	A	S/E SEAL HOUSING
	8	10	3/8-16 X 1 SS (HEX SOCKET)	G0003064	252 IN-LBS	A	S/E BOWL HEAD
	2	09	PLASTIC CAP	G0003467	N/A	N/A	S/E BOWL HEAD
	4	08	1/8 NPT X 3/4 SS (GREASE FITTING)	G0003513	N/A	N/A	S/E BOWL HEAD
⚠5⚠3	2	07	5/16-18 X 1/2 SS (SET SCREW CUP POINT)	G0005508	N/A	262L	S/E BOWL HEAD
	4	06	1/4 X 1 1/4 PIN (STEEL)	G0001744	N/A	680L	S/E BOWL HEAD
	4	05	3/8-16 X 1 SS (HEX SOCKET)	G0003064	252 IN-LBS	A	L/E SEAL HOUSING
	8	04	3/8-16 X 1 1/2 SS (HEX SOCKET)	G0003066	252 IN-LBS	A	L/E BEARING HOUSING
	1	03	5/16 X 5/16 X 3 KEY	G0003872	N/A	N/A	L/E BOWL HEAD
*	4	02	5/16 X 1 PIN (STEEL)	PP1362	N/A	680L	L/E BOWL HEAD
	12	01	3/8-16 X 1 1/4 SS (HEX SOCKET)	G0003065	252 IN-LBS	A	L/E BOWL HEAD
	QTY	ITEM	HARDWARE REQUIRED	PART NO# (PER PC)	TORQUE SETTING	LUBRICANT	REFERENCE PART

⚠1
NOTES:
1) MATERIAL: (HEX SOCKET BOLTS)
ALLOY STEEL – TENSILE STRENGTH 190,000 PSI MINIMUM (HEAT TREATED)
STAINLESS STEEL – TENSILE STRENGTH 80,000 PSI MINIMUM
2) QUANTITY LISTED IS PER ROTATING ASSEMBLY
3) * A) ITEMS 02 & 21 QTYS ARE (4) FOUR FOR UNITS PRIOR TO SERIAL NUMBER CF000272
* B) ITEM 02 QTY IS (2) TWO & ITEM 21 QTY IS (6) SIX FOR UNITS WITH SERIAL NUMBERS IN THE RANGE OF CF000272 TO CF000678
⚠5 * C) ITEM 02 QTY IS (0) ZERO & ITEM 21 QTY IS (9) NINE FOR UNITS WITH SERIAL NUMBERS ABOVE CF000679
** D) ITEMS 35 & 37 ARE NOT REQUIRED AFTER UNIT CF000678
⚠3 *** E) ITEM 33 TO BE USED WITH ROTODIFF ASSY 107/D6V
ITEM 39 TO BE USED WITH ROTODIFF ASSY 1071

REV	CHANGE	CKD	DATE
8	ADDED GEARBOX VIEW; MOVED BALLOON 34 TO GEARBOX VIEW; SEE MODEL SPACE & RECORD COPY FOR REVISIONS 1 THRU 7.	CCS	5/12/09

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TITLE: CENTRIFUGE ROTATING ASSEMBLY
HARDWARE PARTS LIST

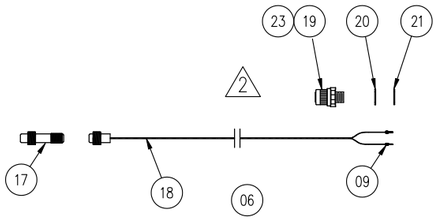
DWN NVB | CKD | DATE 3/21/01 | SCALE 1:5 | REV 8

SHEET SIZE C | Y | DWN | F C | CKD

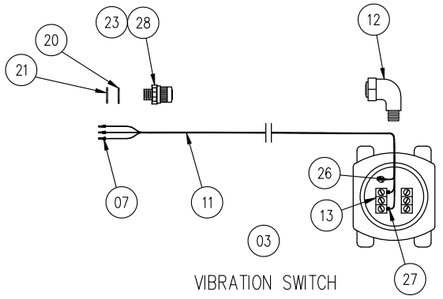
DRAWING NO. 14894-00

DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

CENT, MAN, BOM



SPEED SENSOR



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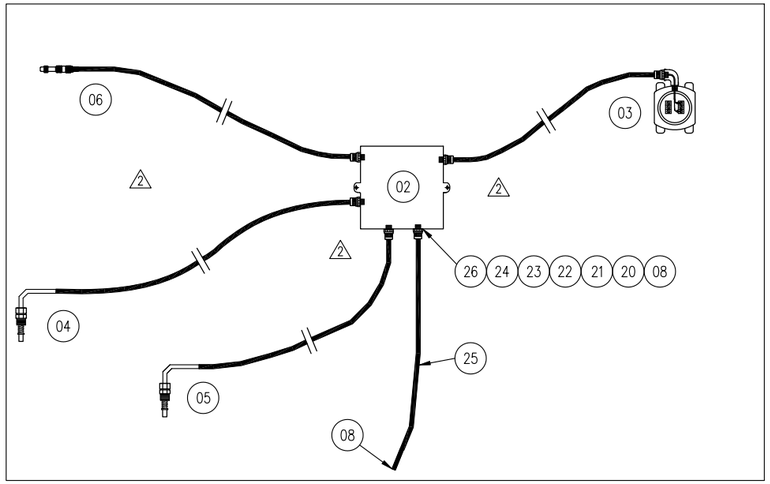
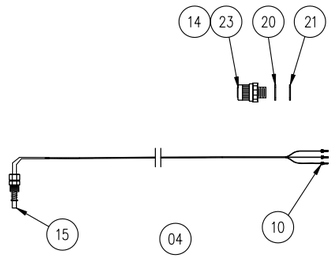
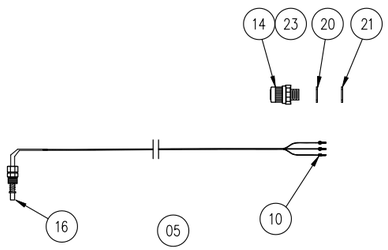




LIQUID END RTD SENSOR



SOLID END RTD SENSOR

7				1		28	FITTING,CORD–.500 NPT X .500–.625 DIA	PP1385
				3		27	RING TERMINAL 16AWG	PV14–6RN–M
				1	1	26	HEAT SHRINK GREEN/YELLOW (21 INCHES)	G0012517
7					1	25	CABLE, INTRINSIC 18AWG–18C BLUE (162 INCHES)	G0008403
					1	24	FITTING,CORD–.500 NPT X .375–.500 DIA	G0001687
	1	1	1	1	1	23	PLASTIC INSULATED BUSHING .050	PP1290
7					1	22	FERRULE,WIRE–14AWG BLU	G0002648
	1	1	1	1	1	21	LOCKNUT .050	G0008575
	1	1	1	1	1	20	SEALING GASKET .050	G0008574
	1					19	FITTING,CORD–.500 NPT X .125–250 DIA	G0002711
8	1					18	CABLE, SPEED SENSOR 2 METER (CUT DOWN TO 36 INCHES)	G0007862
	1					17	SPEED SENSOR, 12MM EMBEDABLE	G0007861
		1				16	RTD SENSOR, BEARING, 316SS 136" WIRE PVC COAT	G0008090
			1			15	RTD SENSOR, BEARING, 316SS 41" WIRE PVC COAT	G0008089
		1	1			14	FITTING, STRAIGHT .500" NPT .250 – .375	G0004418
				1		13	VIBRATION SWITCH	G0003015
7				1		12	FITTING, 90 DEGREE ELBOW .500" NPT .500 – .625	G0001713
				1		11	CABLE,MARINE SHIPBOARD–GEXOL INSUL #16–3 COND (55 INCHES)	G0007163
		3	3			10	FERRULE 26AWG	G0012492
	2					09	FERRULE 24AWG	G0008931
					36	08	FERRULE 18AWG	G0003538
				3		07	FERRULE 16AWG	G0004464
8	X				1	06	SPEED SENSOR ASSY, LENGTH IS 36"	16615–06
		X			1	05	SOLID END RTD ASSY, LENGTH IS 136"	16615–05
			X		1	04	LIQUID END RTD ASSY, LENGTH IS 41"	16615–04
				X	1	03	VIBRATION SWITCH ASSY, LENGTH IS 55"	16615–03
7					1	02	JUNCTION BOX, SENSOR ELECTRONICS ASSY	16584–01–005
					X	01	DE–1000 BASE ELECTICAL COMPONENT KIT	16615–01
	QTY					ITEM	PART NAME	PART NUMBER

REF: G.A. #14738–00–004
REF: W.S. #14394–00–010

REV	CHANGE	CKD	DATE
8	REVISE ITEM 06 (WAS SHOWN AS 82"), REVISE ITEM 18 DESCRIPTION TO BE CLEARER	JFS	07/16/12
7	REVISE 02 (WAS 16584–01), REVISE 12 QTY (WAS 2), REVISE 22 (WAS G0007994), ADD ITEM 28, REVISE 25 DESCRIPTION (WAS 153"), REVISE FRONT VIEW FOR ACCURACY	JFS	06/11/12
6	REVISE PARTS LIST TO INCLUDE MORE DETAILS, SEE MODEL SPACE FOR ORIGINAL PARTS LIST FOR REV 1–5	JFS	02/23/12
5	REVISE ITEMS 15 & 16 (WAS G0008126 AND 8127)	JFS	09/01/10
4	DELETE ITEMS 23 AND 24 DUPLICATES OF 18 AND 20	JFS	08/25/09
3	REMOVED ITEM 08, WAS PP1383, CHANGED ITEM 07 (WAS G0002377), ITEM 13 WAS 60" ITEM 14 WAS 148", ADDED ITEMS 23 & 24	KWJ / JWC	10/21/08
2	REVISED LOCATION OF SENSORS AND CONNECTION POINTS, ADDED ITEMS 18, 19, 20, 21, 22 CHANGED ITEM 12 (WAS 185–2521)	JWC / JFS	08/27/08
1	ADDED SPECIFIC LENGTHS TO PART NAME	KWJ / JFS	4/23/08

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TITLE: PARTS LIST FOR VFD DE–1000 BASE SENSOR SYSTEM

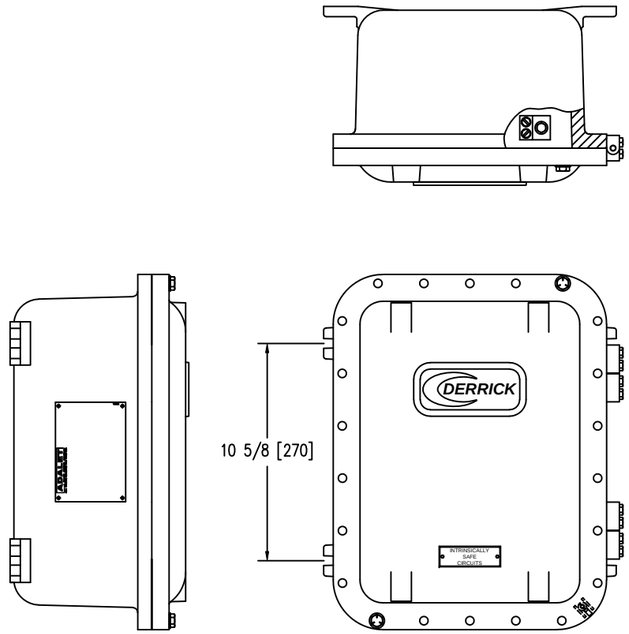
DWN MS | CKD JFS | DATE 02/14/07 | SCALE NONE | REV 8

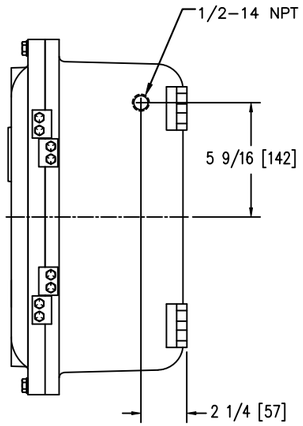
SHEET SIZE C | N | DWN | F C | CKD

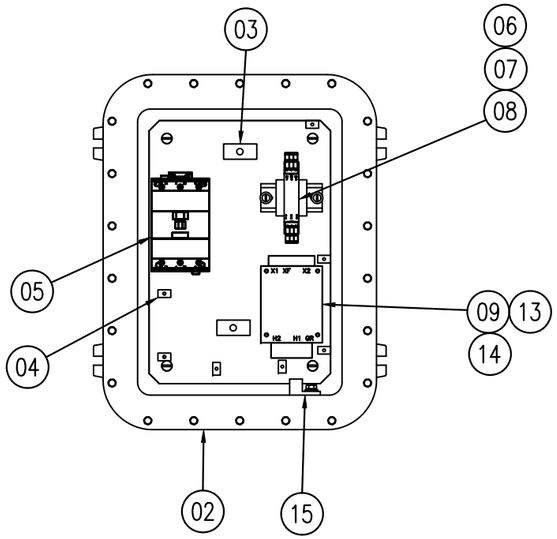
DRAWING NO. 16615–00

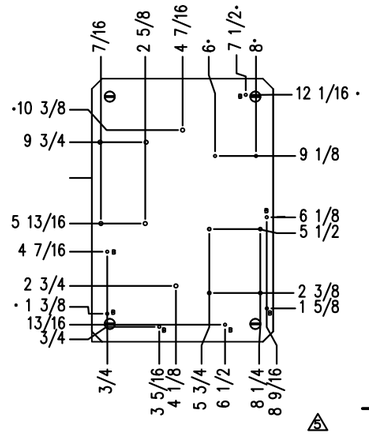
DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

BOM,CENT,MAN

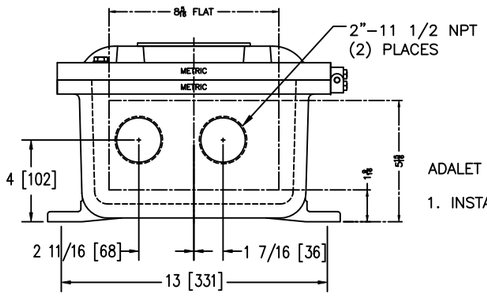








ALL HOLES 10–32 TAPPED HOLE
EXCEPT WHERE NOTED. (12 PLACES)
B= 8–32 TAPPED HOLE (7 PLACES)



ADALET ASSEMBLY NOTES:

1. INSTALL METRIC STAINLESS BOLT AND WASHER AS SHOWN.

	QTY	ITEM	PART NAME/DESCRIPTION	DWG. NO.
5	1	15	GROUND LUG, DUAL 6–250MCM W/ .375 MTG HOLE	G0008896
2	1	14	TIME DELAY FUSE, 1.25 AMP 250V STYLE TRM	G0002926
5,2	2	13	TIME DELAY FUSE, 0.40AMP 600V STYLE ATQR	G0008999
5,2		12	NOT USED	
5,2		11	NOT USED	
5		10	NOT USED	
5,2	1	09	TRANSFORMER, CONT–575V PRI/115V SEC 100VA	G0009000
6,3	1	08	SWITCH AMP, BARRIER,INTRINSIC	G0009286
	2	07	END CLAMP FOR 35 MM DIN	G0007012
	1	06	DIN RAIL, 35 X 7.5MM X 1.5" ZPL STL	G0006292
	1	05	CONTACTOR, IEC–100A/AC–1 600V W/115V COIL	G0008060
5,4	6	04	WIRE TIE BASE SMALL	PAN–TM3S10–C
5,4	2	03	WIRE TIE BASE LARGE	G0003519
5,4,1	1	02	ENCLOSURE, EP–10"X14"X6" NEMA 4X,7&9 AL SA1123	G0008929
X		01	ASSEMBLY	16622–01–001

REF GA #14738–00–004
REF W.S.# 14394–00–010

REV	CHANGE	CKD	DATE
6	REVISE ITEM 08 (WAS G0008526)	JWC JFS	12/16/10
5	ADD BACK PANEL DRILLING PATTERN REMOVE ITEMS 03 AND 04 (WERE G0008891 & G0008892), ADD NEW ITEM 03 AND 04	JWC JFS	
4	CHANGE ITEM 02 (WAS G0008056), OMIT ITEMS 10, 11 & 12, CHANGE ITEM 09 (WAS G0002483), CHANGE ITEM 13 (WAS G0004195), CHANGE ITEM 15 (WAS 2–G0008070)	JWC JFS	08/30/10
3	CHANGED ITEMS 03 AND 04 (WAS G0001666 AND G0001667), ADD S NUMBER TO ITEM 02 ADD CONDUIT HOLE DIMENSIONS	JWC JFS	12/09/08
3	CHANGED ITEM 08 (WAS G0003789), ADD VOLTAGE TO TITLE BLOCK	JWC JFS	10/08/08
2	REVISED ITEMS 09, 11, 12, 13 AND 14 (WAS G0008058, G0002873, G0002874, G0002909 AND G0002912)	JWC JFS	09/18/08
1	CORRECTED BOX DIMENSIONS (WAS 10"X12"X8")	JWC JFS	02/06/08

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TITLE: XP ELECTRICAL CONTROL PANEL FOR VFD DE–1000 WITH SKID 575/600V

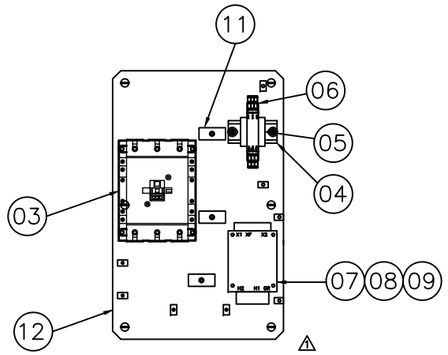
DWN JFS | CKD MJS | DATE 05/23/07 | SCALE NTS | REV 6

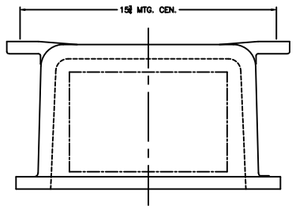
SHEET SIZE C | N | F C | DWN DRC 06/11/07 | CKD JFS 06/11/07

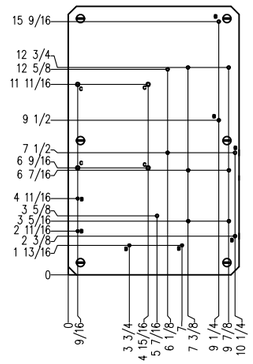
DRAWING NO. 16622–00–001

DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

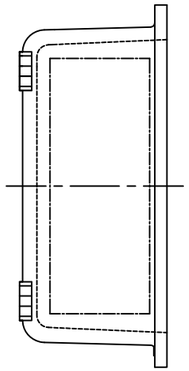
CENT, BOM

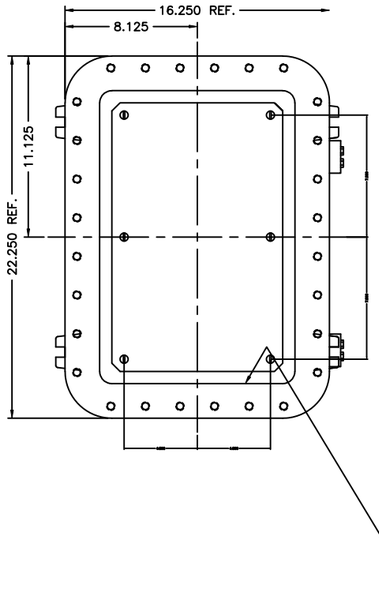


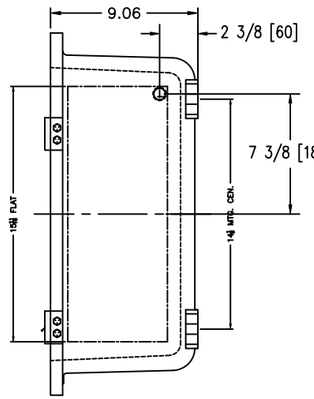


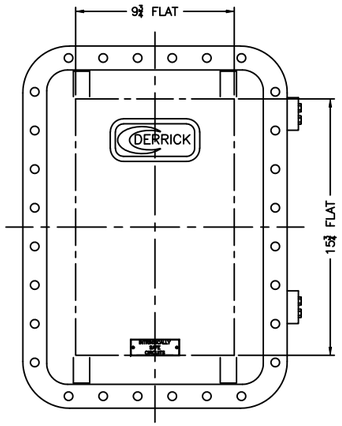


ALL HOLES 10-32 TAPPED HOLE
EXCEPT WHERE NOTED. (9 PLACES)
B= 8-32 TAPPED HOLE (8 PLACES)
C= 1/4-20 WELD NOT (4 PLACES)
2

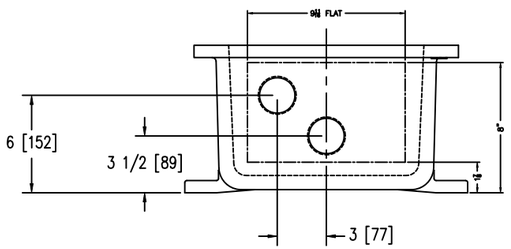








XCE 1218 COVER



QTY	ITEM	PART NAME/DESCRIPTION	PART NO.
8	12	WIRE TIE BASE SMALL	PAN-TM3S10-C
3	11	WIRE TIE BASE LARGE	G0003519
1	10	GROUND LUG	G0008896
1	09	FUSE, 1.25 AMP 250V	G0002926
2	08	FUSE, TIME DELAY, 0.6AMP 600V STYLE FNQR	G0003996
1	07	TRANSFORMER, CONT-380V PRI/110V SEC 100VA	G0002482
1	06	SWITCH AMP, BARRIER,INTRINSIC	G0009286
2	05	END CLAMP FOR 35 MM DIN	G0007012
1	04	DIN RAIL, 35 X 7.5MM X 1.5" ZPL STL	G0006292
1	03	CONTACTOR, IEC-160A (AC-1) 600V W/120V 50HZ COIL	G0008789
1	02	ENCLOSURE, XP-12"X18"X8" NEMA 4X,7&9 AL SA1035	G0008900
X	01	ASSEMBLY	16622-01-004

2

REF GA #14738-00-006
REF W.S.# 14394-00-017
REF CEP.# 16545-00-004

REV	CHANGE	CKD	DATE
2	REVISE ITEM 06 (WAS G0008526), ADD BACK PAN DRILLING DETAIL	JWC JFS	12/16/10
1	REVISED BACK PAN LAYOUT, OMITTED SECOND VIEW OF BACK PAN	JWC JFS	10/21/09

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TITLE: EXPLOSIONPROOF ELECTRICAL CONTROL PANEL FOR VFD DE-1000 380/400V 50HZ

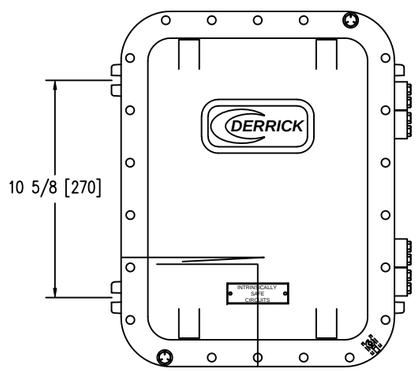
DWN JFS | CKD MJS | DATE 05/23/07 | SCALE NTS | REV 2

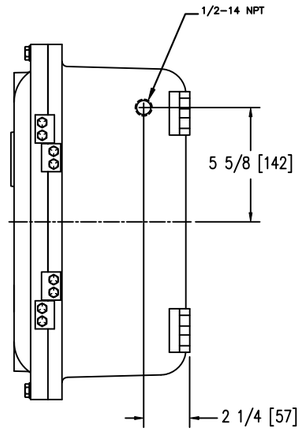
SHEET SIZE C | N | DWN JWC 07/02/08 | CKD JFS 07/06/08

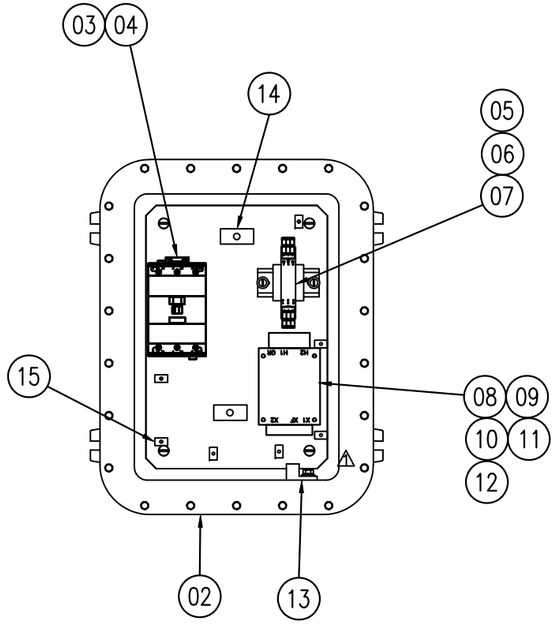
DRAWING NO. 16622-00-004

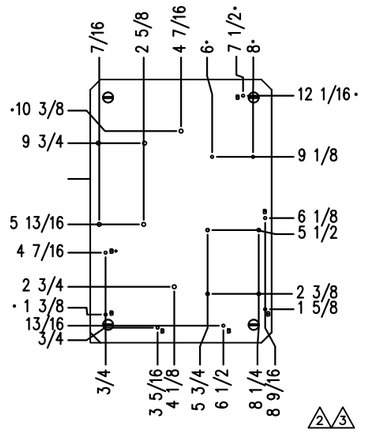
DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

CENT, BOM





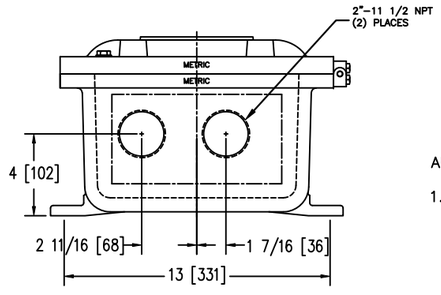




ALL HOLES 10-32 TAPPED HOLE
EXCEPT WHERE NOTED. (12 PLACES)
B= 8-32 TAPPED HOLE (7 PLACES)

ADALET
TBD

NAMEPLATE DETAIL



ADALET ASSEMBLY NOTES:

1. INSTALL METRIC STAINLESS BOLT AND WASHER AS SHOWN.

QTY	ITEM	PART NAME/DESCRIPTION	PART NO.
	01	ASSEMBLY	16622-01-005
1	02	ENCLOSURE, EP-10"X14"X6" NEMA 4X,7&9 AL SA1123	G0008929
1	03	CONTACTOR, IEC-100A (AC-1) 600V W/120V COIL	G0008060
	04	NOT USED	
2	05	DIN RAIL, 35 X 7.5MM X 1.5" ZPL STL	G0006292
2	06	END CLAMP FOR 35 MM DIN	G0007012
1	07	SWITCH AMP, BARRIER,INTRINSIC	G0009286
1	08	TRANSFORMER, CONT-480V PRI/120V SEC 100VA	G0002481
	09	NOT USED	
	10	NOT USED	
1	11	TIME DELAY FUSE, 0.5AMP 600V STYLE ATQR	G0004195
1	12	TIME DELAY FUSE, 1.25 AMP 250V	G0002926
1	13	GROUND LUG-250MCM DUAL ONE MTG HOLE MECH	G0008896
2	14	WIRE TIE BASE LARGE	G0003519
7	15	WIRE TIE BASE SMALL	PAN-TM3S10-C

REF GA #14738-00-007
REF W.S.# 14394-00-018
REF CEP.# 16545-00-002

REV	CHANGE	CKD	DATE
3	REVISE SEVERAL HOLE DIMENSIONS ON BACK PLATE.	JWC/JFS	12/13/10
2	ADD BACK PANEL DRILLING PATTERN, REVISE ITEM 08 (WAS G0008401) DELETE 09 & 10 REVISE ITEM 03 (WAS G0008425) ,REVISE ITEM 07 (WAS G0008526), DELETE ITEM 04	JWC/JFS	08/31/10
1	ADD BACK PANEL TO LAYOUT	JWC/JFS	10/08/08

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TITLE: XP ELECTRICAL CONTROL PANEL FOR VFD DE-1000 WITH SKID 460/480 V

DWN JFS | CKD MJS | DATE 05/23/07 | SCALE NTS | REV 3

SHEET SIZE C | FC N | DWN JWC 08/20/08 | CKD JFS 08/20/08

DRAWING NO. 16622-00-005

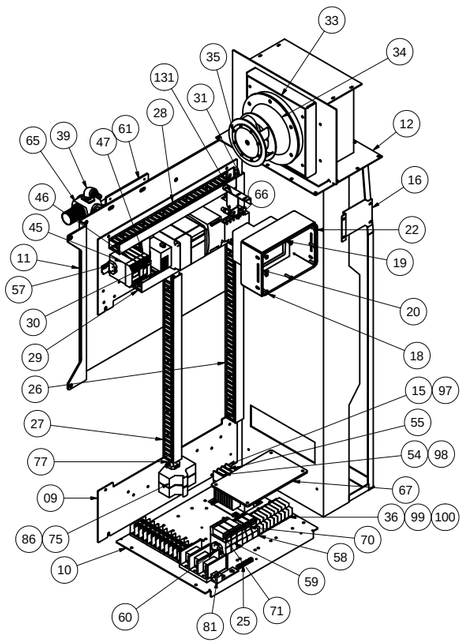
DERRICK® CORPORATION
590 DUKE ROAD BUFFALO, NY 14225 U.S.A.

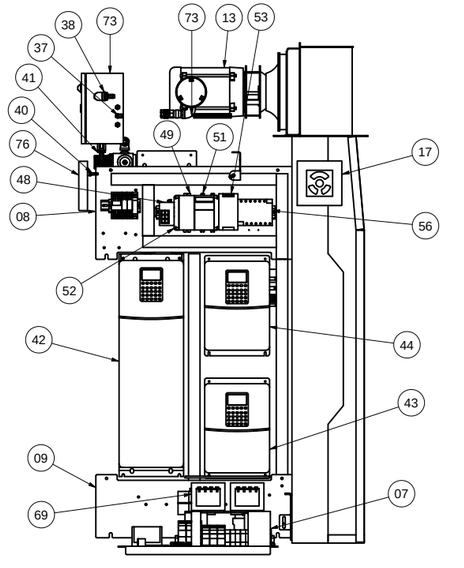
CENT, BOM, PUR

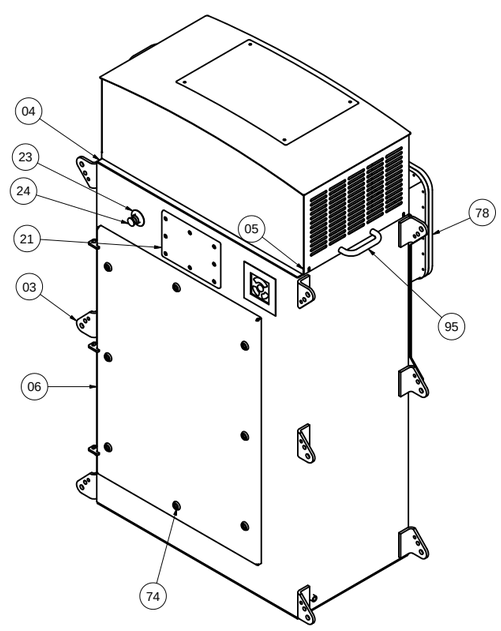
ITEM	QTY	DRAWING NUMBER	DESCRIPTION
01	X	16545-01-001	ASSEMBLY COMPLETE
02	1*	16397-01-004	ENCLOSURE FRAME ASSEMBLY
03	1*	16398-01-004	ENCLOSURE FRONT ASSEMBLY
04	1*	16399-01-003	ENCLOSURE REAR ASSEMBLY
05	1	16401-01-003	CONDENSER COVER ASSEMBLY
06	1	16400-01-004	DOOR ASSEMBLY
07	1	16404-01-005	COMPONENT MOUNT ASSEMBLY
08	1	16404-01-006	COMPONENT PANEL (UPPER)
09	1	16404-02-006	COMPONENT PANEL (LOWER)
10	1	16404-03-006	COMPONENT PANEL (BOTTOM)
11	1	16597-01-001	ENCLOSURE MOUNTING BRACKET
12	1	G0002881	AIR CONDITIONER, 12,000 BTU/HR 460/60/3
13	1	G0007588	AIR CONDITIONER COOLING MOTOR
14	1	16403-01-001	A/C SUPPORT BRACKET
15	1	G0008059	TRANSFORMER, 575 V PRI/120V SEC/500VA
16	1	16609-01	CONTROL MOUSE COVER
17	1	17006-01	INDUSTRIAL MOUSE/POINTER ASSEMBLY
18	1	G0004364	O-RING, PROTECTIVE COVER
19	1	G0007976	OPERATOR INTERFACE 125V-PROGRAMMED
20	1	16405-01	DISPLAY SCREEN MOUNT
21	1	15181-01-001	DISPLAY SCREEN PROTECTIVE COVER
22	8	G0008007	1/4-20 SEALING PAN HEAD SCREW
23	1	G0007244	NAMEPLATE, EMERGENCY STOP
24	1	G0005325	BUTTON, EMERGENCY STOP
25	1	G0005309	BAR, GROUNDING BUS
26	1	G0007650	WIRE DUCT, 1 1/2 X 2 X 29
27	1	G0007651	WIRE DUCT, 1 1/2 X 2 X 30 1/2
28	1	G0007646	WIRE DUCT, 1 1/2 X 2 X 22 1/4
29	1	G0007647	WIRE DUCT, 1 1/2 X 2 X 18
30	1	G0007648	WIRE DUCT, 1 1/2 X 2 X 6 7/8
31	1	G0007649	WIRE DUCT, 1 1/2 X 2 X 11 1/2
32	1	G0007641	DIN RAIL 35MM X 16
33	1	15197-01-003	INLET CONE EXTENSION
34	1	G0002604	INLET CONE
35	1	G0002603	FAN WHEEL, 8" BACKWARD CURVED
36	3	G0007214	FUSE BLOCK, 30 AMP 3P CLASS CC
37	1	IMP-116B-02X02	1/8 90 DEG STREET ELBOW, BRASS
38	1	G0008003	1/2 90 DEG STREET ELBOW, BRASS
39	2	G0002714	1/2 90 DEG ELBOW, SST
40	1	G0004679	1/8 X 3/16 HOSE BARB
41	3	G0008004	1/2 X 1/2 HOSE BARB
42	1	G0008051	DRIVE, 50 HP 600 VAC 60 HZ
43	1	G0008053	DRIVE, 20 HP 600 VAC 60 HZ
44	1	G0008052	DRIVE, 15 HP 600 VAC 60 HZ
45	1	17244-01	BARRIER, INTRINSIC SAFE-SPEED SENSOR-PROGRAMMED
46	2	G0007918	BARRIER, INTRINSIC SAFE-RTD SENSOR
47	1	G0009286	BARRIER, INTRINSIC SAFE-VIBR SWITCH
48	1	G0007231	ETHERNET SWITCH, 6 PORT
49	1	G0007228	PLC, COMPACTLOGIX PROCESSOR
50	1	G0007229	PLC POWER SUPPLY
51	1	G0007230	PLC END CAP
52	1	G0007995	COMPACT FLASH MEMORY CARD
53	1	G0003552	POWER SUPPLY, 24VDC, 5 AMP
54	1	G0002911	FUSE, TIME DELAY 7.0 A 250 VAC STYLE "CC"
55	2	G0009183	FUSE, TIME DELAY 2.0 A 600 VAC STYLE "CC"
56	1	G0003504	SURGE SUPPRESSOR, 120V 60HZ
57	10	G0008507	TERMINAL BLOCK END BARRIER
58	3	G0003486	HOLDER,FUSE-CUBE STYLE 60 AMP 600V
59	3	G0007585	HOLDER,FUSE-CUBE STYLE 100 AMP 600V
60	1	G0008129	DIN RAIL 35MM X 13 1/2
61	1	16598-01-001	AIR FILTER MOUNTING BRACKET
62	2	G0003565	AIR FILTER
63	1	NPLE-50X200S-4	1/2 X 2 PIPE NIPPLE, SST
64	3	G0002716	1/2 X 1 1/2 PIPE NIPPLE, SST
65	1	G0009927	AIR REGULATOR
66	1	G0009974	SENSOR, RTD
67	1	16441-01-001	TRANSFORMER PROTECTIVE COVER
68	1	G0012461	GEXOL CABLE ASSY #1 AWG- 4 COND
69	2	G0008057	TRANSFORMER,CONT-460V PRI/120V SEC 350VA
70	3	G0003484	FUSE, CUBE STYLE 40 AMP 600V
71	3	G0007583	FUSE, CUBE STYLE 100 AMP 600V
72	1	CRH-EL296	3/4" NPT 90 DEG ELBOW
73	1	G0007865	PURGE UNIT W/RELIEF VALVE
74	8	G0008005	DOOR LATCH
75	1	G0008073	HOLDER, FUSE-TWO POLE CLASS J 50 AMP
76	1	G0008006	RELIEF VALVE (SERIAL # OF PURGE REQUIRED)
77	2	G0007341	DIN RAIL 35MM X 4
78	1	16622-00-001	EX-PROOF ENCLOSURE
79	1	G0009972	SENSOR CABLE
80	1	G0008889	BLOCK,PWR DISTR-3 POLE
81	1	G0007213	GROUND LUG
82	1	S4PE-EL-100	ELBOW,PIPE-1" FPT 90° 304 SST
83	35	G0007252	WIRE DUCT FASTENER MOUNT
84	44	G0003519	WIRE SADDLE, SMALL
85	1	G0009811	FITTING, CORD 2.5" NPT (1.5"-1.8")
86	2	G0008072	FUSE, FAST ACTING 50 AMP CLASS J
87	1	G0007951	ETHERNET CABLE X 8 1/2" (ETH SW-PLC)
88	1	G0008121	ETHERNET CABLE X 51" (ETH SW-15HP)
89	1	G0008122	ETHERNET CABLE X 67" (ETH SW-PNL VIEW)
90	1	G0007952	ETHERNET CABLE X 62" (ETH SW-20HP)
91	1	G0008123	ETHERNET CABLE X 92" (ETH SW-50HP)
92	1	G0007701	LUG, CRIMP #6 AWG
93	1	G0007633	LUG, CRIMP #1 AWG
94	1	G0007256	LUG, CRIMP #2 AWG
95	2	G0004970	HANDLE, COVER
96	1	17382-01	XP CABLE ASSY (2C-20AWG SHIELDED)
97	1	G0002873	COVERS, TOUCH PROOF TERMINAL
98	1	G0002874	COVER/PULLER, FUSE
99	3	G0007589	FUSE, 3.0 AMP ATQR
100	3	FNQ-R-5	FUSE, 5.0 AMP
101	3	G0008792	FUSE, 3.0 AMP ATDR
102	3	G0008892	POWER DIST. BLOCK, OUTGOING 2/0 AWG MAX 1 POLE
103	12	G0008893	POWER DIST. BLOCK COVER
104	3	G0008890	POWER DIST. BLOCK COVER
105	1	17006-02	CABLE, ASSY FOR MOUSE

ITEM	QTY	DRAWING NUMBER	DESCRIPTION
106	7	G0008562	TERMINAL BLOCK- GREY 4 PT
107	14	G0008572	TERMINAL BLOCK- BLUE 2 PT
108	1	G0008544	TERMINAL BLOCK BARRIER- ORANGE 2 PT
109	1	G0008571	TERMINAL BLOCK GROUND- GREEN 2 PT
110	1	G0007662	TERMINAL BLOCK BARRIER, LARGE- ORANGE
111	1	G0009767	CABLE, GEXOL 16 AWG-6 COND ASSY W/ XP GLAND
112			
113	1	TBS-2535	CORD FITTING, 3/4 NPT
114	1	G0004418	CORD FITTING, 1/2 NPT X 1/4 - 3/8
115	1	17382-01	CABLE, INTRINSIC SHIELDED 20AWG-2 COND
116			
117			
118	1	SHPP-200	PLUG, 2 NPT- SQ HD
119	2	G0001687	CORD FITTING, 1/2 NPT X 3/8 - 1/2
120			
121	4	SHPP-100	PLUG, 1 NPT- SQ HD
122	1	G0001686	CORD FITTING, 1 1/2 NPT X 1 3/16 - 1 3/8
123	1	G0008809	CORD FITTING, 1 1/2 NPT X 7/8 - 1
124	1	G0012462	CABLE, GEXOL 4AWG-4 COND ASSY W/ XP GLAND
125	1	G0012463	CABLE, GEXOL 8AWG-4 COND ASSY W/ XP GLAND
126			
127	1	G0012559	BUSHING, REDUCER 2 MPT - 1 1/2" FPT
128			
129			
130	3	G0008891	POWER DISTRIBUTION BLOCK, 3 POLE
131	1	17420-01	A/C THERMOSTAT MOUNTING BRACKET
132	1	G0008563	TERMINAL BLOCK BARRIER-ORANGE 4 PT
133	1	G0009324	TERMINAL BLOCK GROUND- GREEN 4 PT
134	1	G0009863	QUICK CONNECT ELBOW .125 NOT NYLON
135	1	G0009864	TUBING-6MM OD X 1' LONG
136	1	G0012122	VALVE,CHECK-1" NPT FEMXFEM BRASS
137	1	G0012166	ARRESTOR,SPARK-UNIV SST
138	1	G0012167	NIPPLE,PIPE-1"XCLOSE SCHED 40 304 SST
139	1	G0012168	COVER,WATER/DUST

* NOT A REORDERABLE COMPONENT
FOR ENCLOSURE ONLY ORDER 16396-01-004







GA 14738-00-004

REV	DESCRIPTION	BY	DATE
1	DOOR ASSEMBLY WAS 14000-01-002	CCS	5/21/2008
2	17 WAS G0007863, 19 WAS G0007245, 45 WAS 7234, 46 WAS G0007233, 47 WAS G0007232, 55 WAS G0002910, 78 WAS G0007217, 79 WAS G0001666, 84 WAS G0003529, 100 WAS G0007981, ADDED ITEMS 101-127	EJR	10/21/2009
3	ITEM 47 WAS G0008526	EJR	2/9/10
4	ITEM 33 WAS 15197-01-001 PER DRR# 2563; ITEM 65 WAS G0008008; ADDED ITEMS 66, 129, 130, & 131; ITEM 64 QTY WAS 1	DJK	5/6/11
5	ITEM 15 WAS G0008059; 19 WAS G0008825; QTY 25 WAS 2; 45 WAS G0008602; 57 G0007012; 66 WAS G0009973; 68 G000 7866; 80 WAS G0001666; 82 WAS G0004444; 85 WAS G0008799; 96 G0008069; 106 WAS G0007925 QTY 4; 107 WAS G0007236 QTY WAS 11; 108 WAS G0007237 QTY WAS 6; ITEM 109 WAS G0007216 QTY 2;111 WAS G0009767 QTY WAS *; 115 WAS G0007956; 116 WAS G0008799; 117 WAS G0008065;120 WAS G0008075;124 WAS G0008066 QTY WAS *; 125 WAS G0008067 QTY WAS *; 126 G0007154; 128 WAS G0008068; 129 WAS G0008892; ADDED ITEMS 132-139	DMM	6/27/12

GEOMETRIC CHARACTERISTIC SYMBOLS	
FLATNESS	▱
STRAIGHTNESS	—
ROUNDNESS	○
CYLINDRICITY	⌭
PARALLELISM	//
PERPENDICULARITY	⊥
ANGULARITY	∠
RUNOUT	↗
POSITION	⌖
CONCENTRICITY	◎
SYMMETRY	⌯

TOLERANCES UNLESS SPECIFIED

DEC	MM
(2) PLACE DEC. +/- .010	+/- .254
(3) PLACE DEC. +/- .0050	+/- .127
(4) PLACE DEC. +/- .0002	+/- .005
ANGLES +/- 1°	+/- 1°

DO NOT SCALE DRAWING

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DRAWN	fjmonroe	5/22/2007
CHECKED	CCSMITH	6/8/2007
QA		
MFG		
APPROVED		

DERRICK® CORPORATION

TITLE

CONTROL ENCLOSURE FOR DE-1000™ EX-PROOF 575/60/3

SIZE	FILECOPY	DWG NO	REV
D	Y	16545-00-001	5

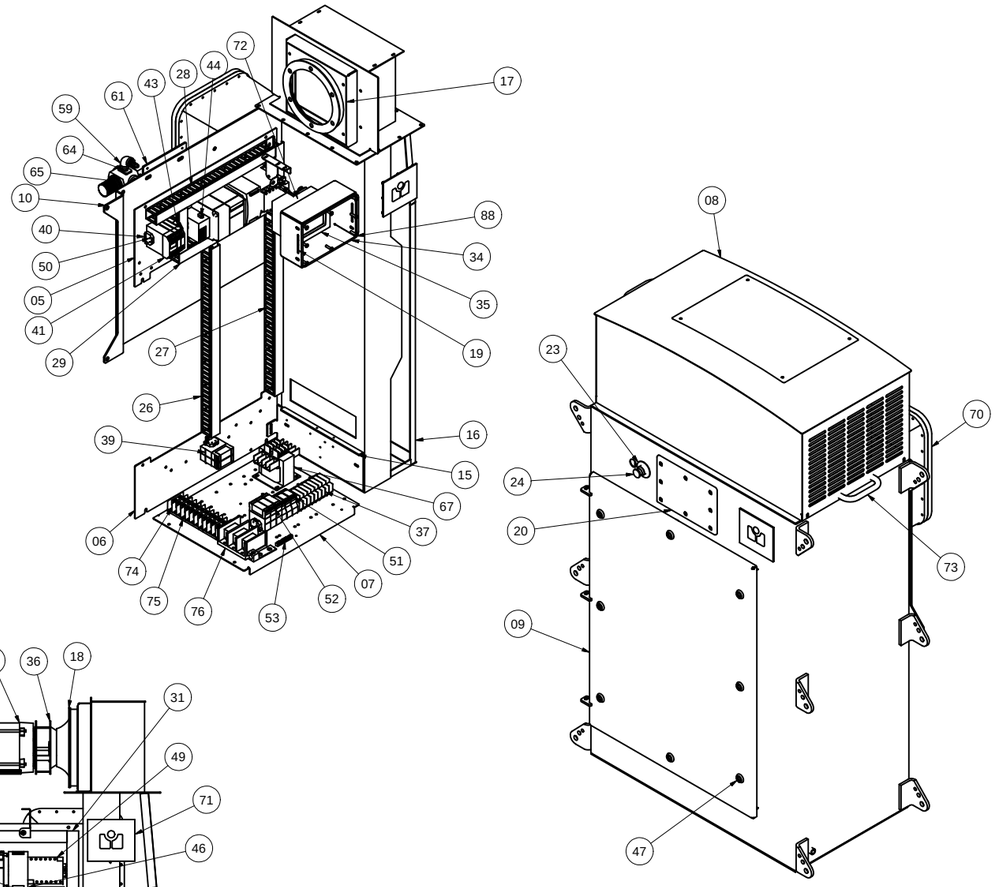
SCALE 1:10 SHEET 1 OF 1

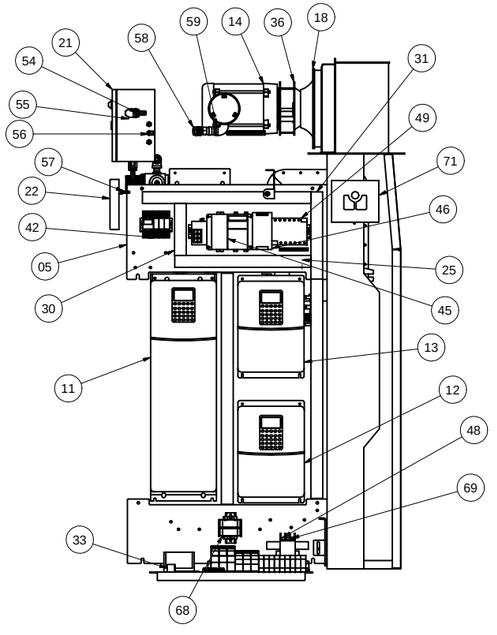
LO, WE, CENT, MAN A

ITEM	QTY	DRAWING NUMBER	DESCRIPTION
01	X	16545-01-002	ASSEMBLY COMPLETE
02	1	16397-01-004	ENCLOSURE FRAME ASSEMBLY
03	1	16398-01-004	ENCLOSURE FRONT ASSEMBLY
04	1	16399-01-003	ENCLOSURE REAR ASSEMBLY
05	1	16404-01-006	COMPONENT PANEL (UPPER)
06	1	16404-02-006	COMPONENT PANEL (LOWER)
07	1	16404-03-006	COMPONENT PANEL (BOTTOM)
08	1	16401-01-004	CONDENSER COVER
09	1	16400-01-004	DOOR ASSEMBLY
10	1	16597-01-001	ENCLOSURE MOUNTING BRACKET
11	1	G0008359	DRIVE, 50 HP 460 60 HZ
12	1	G0008360	DRIVE, 15HP 460 60 HZ
13	1	G0007241	DRIVE, 20HP 460 60 HZ
14	1	G0007588	AIR CONDITIONER COOLING MOTOR
15	1	16403-01-001	A/C SUPPORT BRACKET
16	1	G0002881	AIR CONDITIONER, 12,000 BTU/HR 460/60/3
17	1	15197-01-003	INLET CONE EXTENSION
18	1	G0002604	INLET CONE
19	1	16405-01	DISPLAY SCREEN MOUNT
20	1	15181-01-001	DISPLAY SCREEN PROTECTIVE COVER
21	1	G0007865	PURGE UNIT W/RELIEF VALVE
22	1	G0008006	RELIEF VALVE (SERIAL # OF PURGE REQUIRED)
23	1	G0007244	NAMEPLATE, EMERGENCY STOP
24	1	G0005325	BUTTON, EMERGENCY STOP
25	1	G0007610	GROUND BUS BAR, INCOMING
26	1	G0007651	WIRE DUCT, 1/2 X 2 X 30 1/2
27	1	G0007650	WIRE DUCT, 1/2 X 2 X 29
28	1	G0007646	WIRE DUCT, 1/2 X 2 X 22 1/4
29	1	G0007647	WIRE DUCT, 1/2 X 2 X 18
30	1	G0007648	WIRE DUCT, 1/2 X 2 X 6 7/8
31	1	G0007649	WIRE DUCT, 1/2 X 2 X 11 1/2
32	1	G0007641	DIN RAIL 35MM X 16
33	1	G0007213	GROUND LUG, INCOMING
34	1	G0004364	O-RING, PROTECTIVE COVER
35	1	G0008825	OPERATOR INTERFACE 120VAC
36	1	G0002603	FAN WHEEL, 8" BACKWARD CURVED
37	3	G0007214	FUSE BLOCK, 30 AMP 3P CLASS CC
38	3	G0003486	FUSE HOLDER, CUBE STYLE 60 AMP 600V
39	5	G0007585	HOLDER,FUSE-CUBE STYLE 100 AMP 600V
40	2	G0007341	DIN RAIL 35MM X 4
41	1	G0008602	BARRIER, INTRINSIC SAFE-SPEED SENSOR
42	2	G0007918	BARRIER, INTRINSIC SAFE-RTD SENSOR
43	1	G0009286	BARRIER, INTRINSIC SAFE-VIBR SWITCH
44	1	G0007231	ETHERNET SWITCH, 6 PORT
45	1	G0007228	PLC, COMPACTLOGIX
46	1	G0003552	POWER SUPPLY, 24VDC, 5 AMP
47	8	G0008005	DOOR LATCH
48	1	G0002911	FUSE, TIME DELAY 7.0A 250VAC STYLE CC
49	1	G0003504	SURGE SUPPRESSOR, 120V 60HZ
50	8	G0007012	TERMINAL BLOCK END BARRIER
51	3	G0003484	FUSE,CUBE STYLE-40 AMP 600V
52	3	G0007583	FUSE,CUBE STYLE-100 AMP 600V
53	1	G0005309	GROUND BUS BAR
54	3	G0008004	1/2 X 1/2 HOSE BARB
55	1	G0008003	1/2 90 DEG STREET ELBOW, BRASS
56	1	IMP-116B-02X02	1/8 90 DEG STREET ELBOW, BRASS
57	1	G0004679	1/8 X 3/16 HOSE BARB
58	1	G0004444	1/2" CABLE GLAND
59	3	G0002714	1/2 90 DEG ELBOW, SST
60	1	G0008129	DIN RAIL 35MM X 13 1/2
61	1	16598-01-001	AIR FILTER MOUNTING BRACKET
62	2	G0003565	AIR FILTER
63	1	NPLE-50X200S-4	1/2 X 2 PIPE NIPPLE, SST
64	3	G0002716	1/2 X 1 1/2 PIPE NIPPLE, SST
66	1	G0007866	GLAND,CABLE EP-2"NPT 1.42-2.07" DIA BRASS
67	1	G0003494	TRANSFORMER,CONT-480V PRI/120V SEC 500
68	2	G0007623	FUSE,CUBE STYLE-70 AMP 600V
69	2	G0002910	FUSE,TIME DELAY-2.5 AMP 600V CLASS CC
70	1	16622-01-005	EXPLOSION PROOF ELECTRICAL ASSEMBLY
71	1	17006-01	MOUSE ASSY,VFD CENTRIFUGE-KIT
72	1	17006-02	BRACKET ASSY,VFD CENTRIFUGE-KIT
73	2	G0004970	HANDLE,COVER
74	3	G0008891	BLOCK,PWR DISTR-3 POLE 2/0-#14
75	3	G0008892	BLOCK,PWR DISTR-3 POLE 2/0-#14 ADDER
76	1	G0008889	BLOCK,PWR DISTR-3 POLE #6-350MCM 310A
77	*	G0007252	WIRE DUCT FASTENER MOUNT
78	*	PAN-TM3S10-C	WIRE SADDLE, SMALL
79	*	G0003519	WIRE SADDLE, MEDIUM
80	1	G0007951	ETHERNET CABLE X 8 1/2 (ETH SW-PLC)
81	1	G0008122	ETHERNET CABLE X 67 (ETH SW-PNL VIEW)
82	1	G0008123	ETHERNET CABLE X 92 (ETH SW-60HP)
83	1	G0007952	ETHERNET CABLE X 62 (ETH SW-20HP)
84	1	G0008121	ETHERNET CABLE X 51 (ETH SW-15HP)
85	1	G0007701	LUG, CRIMP #6 AWG
86	1	G0007633	LUG, CRIMP #1 AWG
87	1	G0007256	LUG, CRIMP #2 AWG
88	8	G0008007	1/4-20 SEALING PAN HEAD SCREW
89	1	G0007995	COMPACT FLASH MEMORY CARD
65	1	G0009927	AIR REGULATOR
121	1	G0009973	SENSOR, RTD
122	1	17420-01	A/C THERMOSTAT MOUNTING BRACKET

ITEM	QTY	DRAWING NUMBER	DESCRIPTION
65	1	G0009927	AIR REGULATOR
90	3	G0003493	FUSE, TIME DELAY 15A 600VAC CLASS CC
91	3	G0008792	FUSE, TIME DELAY 3A 600VAC CLASS CC
92	12	G0008893	TERMINAL BLOCK COVER- 2/0
93	3	G0008890	TERMINAL BLOCK COVER- 350MCM
94	6	G0007925	TERMINAL BLOCK- GREY
95	14	G0007236	TERMINAL BLOCK- BLUE
96	5	G0007237	TERMINAL BLOCK BARRIER- ORANGE
97	4	G0007216	TERMINAL BLOCK GROUND- GREEN
98	1	G0007662	TERMINAL BLOCK BARRIER, LARGE- ORANGE
99	1	G0002873	TRANSFORMER COVER
100	1	G0002874	FUSE COVER/PULLER
101	1	G0007230	PLC END BARRIER
102	1	G0007229	PLC POWER SUPPLY
103	*	G0007867	CABLE, GEXOL 1/0 AWG-4 COND
104	1	G0008799	CORD FITTING, 2 1/2 NPT
105	1	G0004418	CORD FITTING, 1/2 NPT
106	1	G0007956	CORD, INTRINSIC SHIELDED 20AWG-2 COND
107	1	SHPP-200	PLUG, 2 NPT-SQ HD
108	1	G0002967	CABLE, GEXOL 16AWG-6 COND
109	1	G0002966	GLAND, XP 3/4 NPT
110	1	TBS-2535	CORD FITTING, 3/4 NPT
111	1	G0008403	CABLE, INTRINSIC SHIELDED 18AWG-18 COND
112	1	G0001687	CORD FITTING, 1/2 NPT X 3/8 - 1/2
113	1	G0001686	CORD FITTING, 1 1/2 NPT X 1 3/16 - 1 3/8
114	3	SHPP-100	PLUG, 1 NPT-SQ HD
115	*	G0007162	CABLE, GEXOL 4AWG-4 COND
116	1	G0007154	GLAND, XP 1 1/4 NPT X 1 1/8 - 1 5/8
117	1	CRH-RE-64	BUSHING, REDUCER 2 MPT - 1 1/4 FPT
118	1	G0008809	CORD FITTING, 1 1/2 NPT X 7/8 - 1
119	*	G0008067	CABLE, GEXOL 8AWG-4 COND
120	1	G0008068	GLAND, XP 1 1/4 NPT 7/8 - 1 5/16
121	1	G0009973	SENSOR, RTD
122	1	17420-01	A/C THERMOSTAT MOUNTING BRACKET

FOR ENCLOSURE ONLY, ORDER: 16396-01-004





REF: 14738-00-007

REVISION HISTORY			
REV	DESCRIPTION	BY	DATE
1	35 WAS G0007245, 41 WAS G0007234, 42 WAS G0007233, 43 WAS G0007232, ADDED ITEMS 90 - 120	EJR	10/21/2009
2	43 WAS G0008526	EJR	1/19/11
3	ITEM 17 WAS 15197-01-001 PER DRR#2563; ADDED ITEMS 121 & 122; ITEM 65 WAS G0008008; ITEM 64 QTY WAS 1	DJK	5/5/11

GEOMETRIC CHARACTERISTIC SYMBOLS	
FLATNESS	▱
STRAIGHTNESS	⏤
ROUNDNESS	○
CYLINDRICITY	⌭
PARALLELISM	//
PERPENDICULARITY	⊥
ANGULARITY	∠
RUNOUT	↗
POSITION	⌖
CONCENTRICITY	◎
SYMMETRY	⌯

TOLERANCES UNLESS SPECIFIED

	DEC	MM
(2) PLACE DEC.	+/- .0100	+/- .254
(3) PLACE DEC.	+/- .0050	+/- .127
(4) PLACE DEC.	+/- .0002	+/- .005
ANGLES	+/- .5°	+/- .5°

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DRAWN	CCSMITH	10/10/2007
CHECKED		
QA		
MFG		
APPROVED		

DERRICK® CORPORATION

TITLE

CONTROL ENCLOSURE ASSEMBLY DE-1000™ EX-PROOF 460/60/3

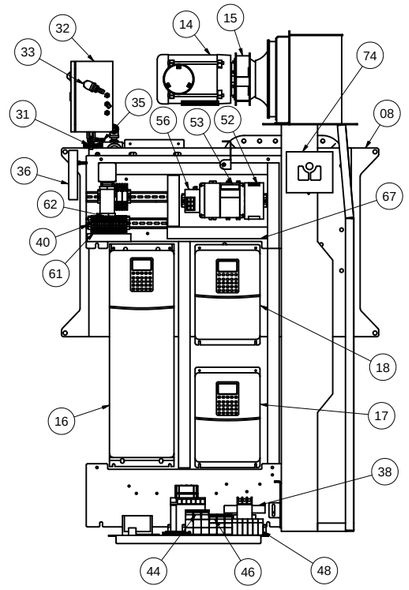
SIZE	FILECOPY	DWG NO	REV
D	Y	16545-00-002	3

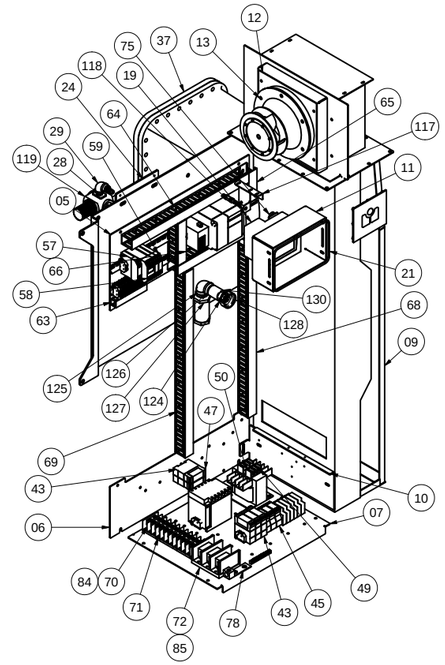
SCALE 1:10 SHEET 1 OF 1

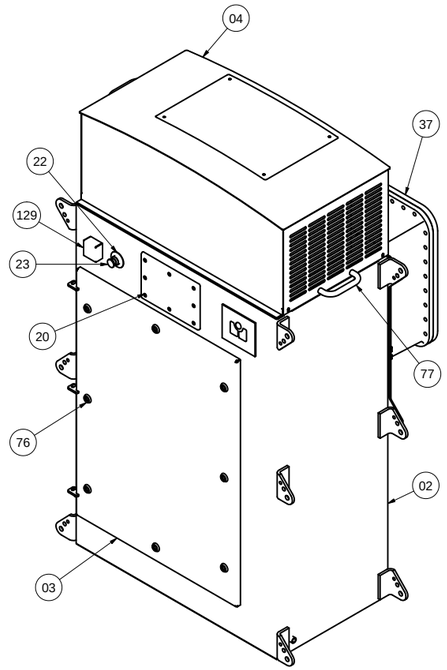
CENT, MAN

ITEM	QTY	DRAWING NUMBER	DESCRIPTION
01	X	16545-01-004	ASSEMBLY COMPLETE
02	1	16396-01-004	ENCLOSURE ASSEMBLY
03	1	16400-01-004	DOOR ASSEMBLY
04	1	16401-01-004	CONDENSER COVER
05	1	16404-01-006	COMPONENT PANEL (UPPER)
06	1	16404-02-002	COMPONENT PANEL (LOWER)
07	1	16404-03-002	COMPONENT PANEL (BOTTOM)
08	1	16597-01-001	EX-PROOF ENCLOSURE MOUNTING BRACKET
09	1	G0002881	AIR CONDITIONER, 12,000 BTU 380/50/3
10	1	16403-01-001	A/C SUPPORT BRACKET
11	1	16405-01	DISPLAY SCREEN MOUNT
12	1	15197-01-003	INLET CONE EXTENSION
13	1	G0002604	INLET CONE
14	1	G0007588	AIR CONDITIONER COOLING MOTOR
15	1	G0002603	FAN WHEEL, 8" BACKWARD CURVED
16	1	G0007579	DRIVE, 50 HP 380V 50HZ
17	1	G0007580	DRIVE, 20 HP 380V 50HZ
18	1	G0007581	DRIVE, 15 HP 380V 50HZ
19	1	G0007976	DISPLAY SCREEN, HMI 120V - PROGRAMMED
20	1	15181-01-001	DISPLAY SCREEN PROTECTIVE COVER
21	1	G0004364	O-RING, PROTECTIVE COVER
22	1	G0007244	NAME PLATE, E-STOP
23	1	G0005325	EMERGENCY STOP BUTTON
24	1	16598-01-001	AIR FILTER MOUNTING ANGLE
25	1	G0002300	AIR FILTER, BX
26	1	G0003565	AIR FILTER, DX
27	1	NPLE-50X200S-4	1/2 X 2 PIPE NIPPLE, SST
28	3	G0002716	1/2 X 1 1/2 PIPE NIPPLE, SST
29	2	G0002714	1/2 90 DEG ELBOW, SST
31	3	G0008004	1/2 X 1/2 HOSE BARB
32	1	G0007865	PURGE UNIT W/RELIEF VALVE
33	1	G0008003	1/2 90 DEG ELBOW, BRASS
34	2	IMP-116B-02X02	1/8 90 DEG ELBOW, BRASS
35	2	G0004679	1/8 X 3/16 HOSE BARB
36	1	G0008006	RELIEF VALVE (SERIAL # OF PURGE UNIT REQUIRED)
37	1	16622-01-004	EX-PROOF ENCLOSURE ELECTRICAL ASSEMBLY
38	1	G0007582	TRANSFORMER,CONT-400V PRI/115V SEC 500 VA
39	1	G0007645	DIN RAIL, 35 MM X 5
40	10	G0008507	TERMINAL BLOCK END STOP, 6mm
41	1	G0003504	SURGE SUPPRESSOR, 120V 60 HZ
42	3	G0007980	DIN RAIL, 35 MM X 11
43	3	G0007585	HOLDER,FUSE-CUBE STYLE 100 AMP
44	3	G0007583	FUSE,CUBE STYLE 100 AMP
45	3	G0003486	HOLDER,FUSE-CUBE STYLE 60 AMP
46	3	G0003484	FUSE,CUBE STYLE 40 AMP
47	2	G0007623	FUSE,CUBE STYLE 70 AMP
48	2	G0007214	FUSE BLOCK, 30A 3P CLASS CC
49	2	G0001651	FUSE, TIME DELAY 3.2A 600VAC
50	1	G0002911	FUSE, TIME DELAY 7.0A 250VAC
51	1	G0007983	DIN RAIL 35 MM X 11 1/2
52	1	G0003552	POWER SUPPLY, 24VDC 5 AMP
53	1	G0007228	PLC COMPACTLOGIX PROCESSOR
54	1	G0007229	PLC POWER SUPPLY
55	1	G0007230	PLC END CAP
56	1	G0007231	ETHERNET SWITCH, 6 PORT
57	1	G0009286	BARRIER, INTRINSIC SAFE-VIBR SWITCH
58	1	17244-01	BARRIER, INTRINSIC SAFE-SPEED SENSOR - PROGRAMMED
59	2	G0007918	BARRIER, INTRINSIC SAFE-RTD SENSOR
60	8	G0007237	TERMINAL BLOCK BARRIER, ORANGE
61	4	G0007216	TERMINAL BLOCK, 2 WIRE GRN/YEL
62	14	G0007236	TERMINAL BLOCK, 2 WIRE BLUE
63	1	G0007979	WIRE DUCT, 1 X 1 X 6 BLUE
64	1	G0007646	WIRE DUCT, 1 1/2 X 2 X 22 1/4
65	1	G0007649	WIRE DUCT, 1 1/2 X 2 X 11 1/2
66	1	G0007648	WIRE DUCT, 1 1/2 X 2 X 6 7/8
67	1	G0007982	WIRE DUCT, 1 1/2 X 2 X 18
68	1	G0007650	WIRE DUCT, 1 1/2 X 2 X 28 7/8
69	1	G0007651	WIRE DUCT, 1 1/2 X 2 X 30 1/2
70	3	G0008891	BLOCK,PWR DISTR-3 POLE 2/0-#14 COPPER
71	3	G0008892	BLOCK,PWR DISTR-1 POLE 2/0-#14 ADDER
72	1	G0008889	BLOCK,PWR DISTR-3 POLE #6-350MCM 310A
73			
74	1	17006-01	INDUSTRIAL MOUSE ASSEMBLY
75	1	17006-02	ADAPTER & MOUNTING BRACKET ASSEMBLY
76	8	G0008005	DOOR LATCH
77	2	G0004970	HANDLE, COVER
78	1	G0007213	GROUND LUG
79	1	G0007995	COMPACT FLASH MEMORY CARD
80	*	G0007252	WIRE DUCT FASTENER MOUNT
81	*	G0003519	WIRE SADDLE, SMALL
82	1	G0002301	AIR FILTER ELEMENT, DX
83	1	G0002302	AIR FILTER ELEMENT, BX
84	12	G0008893	TOUCH PROOF COVER FOR G0008891
85	3	G0008890	TOUCH PROOF COVER FOR G0008889
86	1	G0007951	ETHERNET CABLE X 8 1/2 (ETH SW-PLC)
87	1	G0008121	ETHERNET CABLE X 51 (ETH SW-15HP)
88	1	G0008122	ETHERNET CABLE X 67 (ETH SW-PNL VIEW)
89	1	G0007952	ETHERNET CABLE X 62 (ETH SW-20HP)
90	1	G0008123	ETHERNET CABLE X 92 (ETH SW-50HP)

ITEM	QTY	DRAWING NUMBER	DESCRIPTION
91	6	G0007925	TERMINAL BLOCK- GREY
92	1	G0002873	COVERS, TRANSFORMER
93	1	G0002874	COVER/PULLER, FUSE
94	1	G0005309	BUS BAR, GROUNDING
95	1	G0004444	GLAND, XP 1/2 NPT
96	1	G0004418	CORD FITTING, 1/2 NPT
97	1	SHPP-200	PLUG, PIPE 2 NPT-SQ HD
98	3	SHPP-100	PLUG, PIPE 1 NPT-SQ HD
99	3	G0003493	FUSE, TIME DELAY 15A 600V CLASS CC
100	3	G0008792	FUSE, TIME DELAY 3A 600V CLASS CC
101	1	G0012459	CABLE ASSEMBLY 2/0-4C XP
102			
103	1	G008964	CORD FITTING, 2 1/2 NPT
104	1	G0001687	CORD FITTING, 1/2 NPT X 3/8 -1/2
105	1	TBS-2535	CORD FITTING, 3/4 NPT
106	1	G0002966	GLAND, XP 3/4 NPT
107	1	G0001686	CORD FITTING, 1 1/2 NPT X 1 3/16 - 1 3/8
108	1	G0008809	CORD FITTING, 1 1/2 NPT X 7/8 - 1
109	*	17382-01	CABLE, INTRINSIC SHIELDED 20AWG-2 COND
110	*	G0008403	CABLE, INTRINSIC SHIELDED 18AWG- 18 COND
111	*	G0002967	CABLE, GEXOL 16AWG-6 COND
112	*	G0012462	CABLE ASSEMBLY
113	*	G0012463	CABLE ASSEMBLY
114			
115	1	G0012559	BUSHING, REDUCER 2 MPT - 1 1/2 FPT
116			
117	1	17420-01	A/C THERMOSTAT MOUNTING BRACKET
118	1	G0009974	SENSOR, RTD
119	1	G0009972	SENSOR CABLE
120	1	G0008349	PLC BATTERY (REPLACEMENT ONLY)
121	1	G0007662	TERMINAL BLOCK BARRIER, LARGE, ORANGE
122	1	G0008073	FUSE BLOCK, 60A CLASS J
123	2	G0012311	FUSE BLOCK, 60A CLASS J, FAST ACTING
124	1	G0012152	REDUCER-1"NPT MALE TO M25 FEMALE SST
125	1	S4PE-EL-100	ELBOW,PIPE-1" FPT 90DEG 150# 304 SS
126	2	G0012167	NIPPLE, PIPE-1"XCLOSE SCHED40 304SS
127	1	G0012122	VALVE,CHECK-1" NPT FEMXFEM BRASS
128	1	G0012166	ARRESTOR,SPARK-UNIV SST
129	1	G0012168	COVER,WATER/DUST
130	1	G0002901	COUPLING,FULL-1" NPT 150# 316 SST







REF GA: 14738-00-006
REF W.S. 14394-00-017

REVISION HISTORY			
REV	DESCRIPTION	BY	DATE
1	ITEM 19 WAS G0007245, 49 WAS G0001651, 57 WAS G0007232, 58 WAS G0007234, 59 WAS G0007233, ITEM 61 QTY WAS 3	EJR	10/23/2009
2	57 WAS G0008526	EJR	1/19/11
3	ADDED ITEMS 117 & 118; ITEM 30 WAS G0008008; ITEM 28 QTY WAS 1	DJK	5/5/11
4	ADDED ITEMS 119 - 123. REMOVED ITEMS 73 (WAS G0007610), 120 (WAS G0008785), 114 (WAS G0007154) AND 116 (WAS G0008068). MODIFIED ITEMS 19 (WAS G0008825), 40 (WAS G0007012), 58 (WAS G0008602), 101 (WAS G0007866), 110 (WAS G0008075), 112 (WAS G0008066), 113 (WAS G0008067), 115 (WAS G0012559) AND 118 (WAS G0009973). CHANGED QTY ON ITEMS 43 (WAS 5) AND 85 (WAS 4).	JMB	4/19/12
5	ITEM 05: 16404-01-006 WAS 16404-01-002 (DID NOT WORK), CHANGED PER DRR# 2973	EJR	6/5/12
6	ADDED ITEMS 124 - 130	JMB	7/18/12

GEOMETRIC CHARACTERISTIC SYMBOLS

FLATNESS	▱
STRAIGHTNESS	—
ROUNDNESS	○
CYLINDRICITY	⌭
PARALLELISM	//
PERPENDICULARITY	⊥
ANGULARITY	∠
RUNOUT	↗
POSITION	⌖
CONCENTRICITY	◎
SYMMETRY	⌯

TOLERANCES UNLESS SPECIFIED

DEC	MM
(2) PLACE DEC. +/- .0100	+/- .254
(3) PLACE DEC. +/- .0050	+/- .127
(4) PLACE DEC. +/- .0002	+/- .005
ANGLES	+/- .1°

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DRAWN	CCS	9/18/2008
CHECKED		
QA		
MFG		
APPROVED		

DERRICK® CORPORATION

TITLE

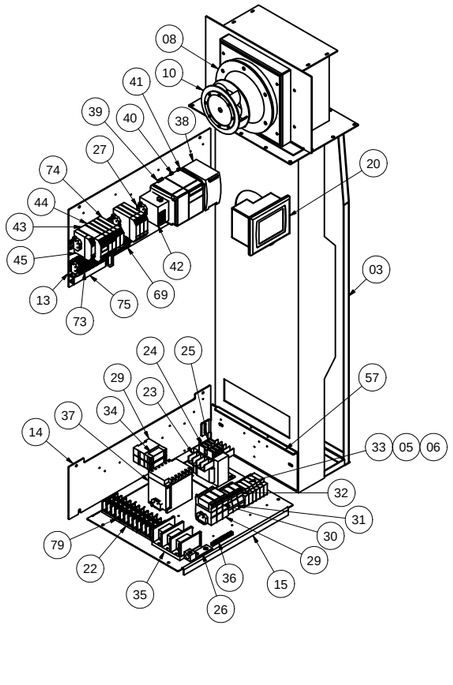
DE-1000™ CONTROL ENCLOSURE ASSEMBLY (380/50/3)

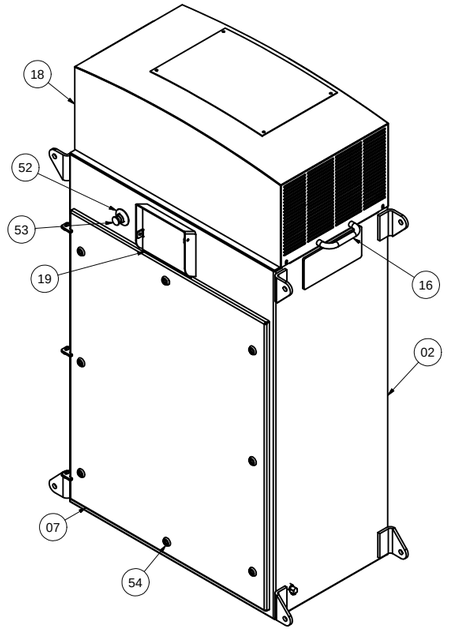
SIZE	FILECOPY	DWG NO	REV
D	N	16545-00-004	5

SCALE 1:10 SHEET 1 OF 1

CENT

Parts List			
ITEM	QTY	DRAWING NUMBER	DESCRIPTION
01	X	16545-01	ASSEMBLY COMPLETE
02	1	16396-01-002	ENCLOSURE ASSEMBLY
03	1	G0002881	AIR CONDITIONER, 12,000 BTU/HR 380/50/3
04			
05	3	G0003493	FUSE,TIME DELAY-15 AMP CLASS CC
06	3	G0008792	FUSE,TIME DELAY-3 AMP CLASS CC
07	1	16400-01-003	DOOR ASSEMBLY
08	1	G0002604	INLET CONE
09	1	G0007588	AIR CONDITIONER COOLING MOTOR
10	1	G0002603	FAN WHEEL, 8" BACKWARD CURVED
11	1	G0007579	DRIVE, 50HP 380 VAC 50HZ
12	1	G0007580	DRIVE, 20HP 380 VAC 50HZ
13	1	16404-01-002	COMPONENT MOUNTING PLATE (UPPER)
14	1	16404-02-002	COMPONENT MOUNTING PLATE (LOWER)
15	1	16404-03-002	COMPONENT MOUNTING PLATE (BOTTOM)
16	2	G0004970	HANDLE, COVER
17	1	15197-01-003	INLET CONE EXTENSION
18	1	16401-01-001	CONDENSER COVER ASSEMBLY
19	1	16547-01-001	INTERFACE SHIPPING BRACKET
20	1	G0008825	OPERATOR INTERFACE
21	1	G0007581	DRIVE, 15HP 380 VAC 50HZ
22	3	G0008891	POWER DIST. BLOCK, OUTGOING MAX 2/0 AWG-3P
23	1	G0007582	TRANSFORMER, 500VA 400V PRI/115V SEC
24	1	G0002911	FUSE, TIME DELAY 7.0A 250VAC
25	2	G0007589	FUSE, TIME DELAY 3.0A 600VAC STYLE "CC"
26	1	G0007213	GROUND LUG
27	1	G0007983	DIN RAIL, 35MM X 16
28	12	G0007012	TERMINAL BLOCK END BARRIER
29	5	G0007585	HOLDER, FUSE-CUBE STYLE 100A 600VAC
30	3	G0007583	FUSE, CUBE STYLE 100A 600VAC
31	3	G0003486	HOLDER, FUSE-CUBE STYLE 60A 600VAC
32	3	G0003484	FUSE, CUBE STYLE 40A 600VAC
33	2	G0007214	FUSE BLOCK, 30A 3P CLASS CC
34	2	G0007623	FUSE, CUBE STYLE 70A 600VAC
35	1	G0008889	BLOCK, POWER DISTRIBUTION
36	1	G0007610	BAR, GROUNDING BUS
37	1	G0003504	SURGE SUPPRESSOR, 120V 60HZ
38	1	G0003552	POWER SUPPLY 24VDC 4A
39	1	G0007228	PLC, COMPACTLOGIX
40	1	G0007229	PLC, POWER SUPPLY
41	1	G0007230	PLC, END CAP
42	1	G0007231	ETHERNET SWITCH
43	1	G0007234	BARRIER, INTRINSIC SAFE-SPEED SENSOR
44	2	G0007233	BARRIER, INTRINSIC SAFE-RTD SENSOR
45	1	G0007232	BARRIER, INTRINSIC SAFE-VIBR SWITCH
46	1	G0007646	WIRE DUCT, 1 1/2 X 2 X 22 1/4
47	1	G0007982	WIRE DUCT, 1 1/2 X 2 X 18
48	1	G0007648	WIRE DUCT, 1 1/2 X 2 X 6 7/8
49	1	G0007649	WIRE DUCT, 1 1/2 X 2 X 11 1/2
50	1	G0007650	WIRE DUCT, 1 1/2 X 2 X 28 7/8
51	1	G0007651	WIRE DUCT, 1 1/2 X 2 X 30 1/2
52	1	G0007244	NAMEPLATE, EMERGENCY STOP
53	1	G0005325	BUTTON, EMERGENCY STOP
54	8	G0008005	LATCH, DOOR
55	1	G0003695	DOOR LATCH GASKET
56	1	G0007575	COMPARTMENT LATCH
57	1	16403-01-001	A/C SUPPORT BRACKET
58	1	CRH-CGE-295	CABLE CONNECTOR-3/4" 90 DEG
59	1	TBS-2535	CABLE CONNECTOR-3/4" STR
60	1	G0007951	ETHERNET CABLE 8 1/2" (ETH SW TO PLC)
61	1	G0008121	ETHERNET CABLE 51" (ETH SW TO 15HP)
62	1	G0008122	ETHERNET CABLE 67" (ETH SW TO PNL VIEW)
63	1	G0007952	ETHERNET CABLE 62" (ETH SW TO 20HP)
64	1	G0008123	ETHERNET CABLE 92" (ETH SW TO 50HP)
65	44	G0003519	WIRE SADDLE-SMALL
66	35	G0007252	WIRE DUCT FASTENER MOUNT
67	1	G0007645	DIN RAIL, 35MM X 5
68	3	G0007980	DIN RAIL, 35MM X 11
69	13	G0007925	TERMINAL BLOCK, 2 WIRE GREY
70	12	G0007237	TERMINAL BLOCK BARRIER- ORANGE
71	6	G0007216	TERMINAL BLOCK END BARRIER
72	1	G0007662	TERMINAL BLOCK SEPARATOR-ORANGE
73	16	G0007236	TERMINAL BLOCK, 2 WIRE BLUE
74	5	G0007918	BARRIER, INTRINSIC-PTC
75	1	G0007979	WIRE DUCT, 1 X 1 X 6-BLUE
76	1	IMP-116B-04X04	1/4 90 DEG STREET ELBOW, BRASS
77	1	16701-01	1/4 NPT DRAIN PLUG
78	1	G0008267	1/2 X 1/4 NPT HOSE BARB
79	3	G0008892	TERMINAL BLOCK, OUTGOING MAX 2/0 AWG-1P
80	12	G0008893	FINGER SAFE COVER FOR G0008891 & G0008892
81	3	G0008890	FINGER SAFE COVER FOR G0008889





REV	DESCRIPTION	BY	DATE
1	ADDED ITEM 75; ADJUSTED BOM QUANTITIES.	CCS	5/23/2007
2	ITEM 22 WAS G0007217; ADDED ITEMS 76-81.	CCS	10/12/2007
3	ITEM 04 WAS 15161-01-002; ITEM 05 WAS 16419-03; ITEM 06 WAS 16419-02; ITEM 07 WAS 16400-01; ITEM 17 WAS 15197-01-001; ITEM 20 WAS G0007245; ITEM 22 WAS G0008329; ITEM 34 WAS G0007623; ITEM 35 WAS G0001666; ITEM 58 WAS G0001713; ITEM 59 WAS PP1383; ITEM 79 WAS G0008328; ITEM 80 WAS G0008266; ITEM 81 WAS G0008265.	CCS	5/27/2009

REF GA: 13593-00-009

GEOMETRIC CHARACTERISTIC SYMBOLS	
FLATNESS	▱
STRAIGHTNESS	⏤
ROUNDNESS	○
CYLINDRICITY	⌭
PARALLELISM	//
PERPENDICULARITY	⊥
ANGULARITY	∠
RUNOUT	↗
POSITION	⌖
CONCENTRICITY	◎
SYMMETRY	⌯

TOLERANCES UNLESS SPECIFIED

	DEC	MM
(2) PLACE DEC.	+/- .0100	+/- .254
(3) PLACE DEC.	+/- .0050	+/- .127
(4) PLACE DEC.	+/- .0002	+/- .005
ANGLES	+/- .1°	+/- .1°

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DERRICK® CORPORATION

TITLE

DE-1000™ CONTROL ENCLOSURE ASSEMBLY

SIZE	FILECOPY	DWG NO	REV
D	N	16545-00	3

SCALE 1:10 SHEET 1 OF 1

LO, WE, CENT

SECTION 9 - INSTALLATION AND MAINTENANCE LOG

PURPOSE

This section should be used by operating and maintenance personnel to record historical information gathered during the installation and operation of the Derrick equipment. If properly kept, the log will be useful for altering maintenance intervals and intercepting trends that may indicate the need for changing operating procedures. Each entry in the log should be dated for future reference and tracking. If required, additional pages may be added to the log by copying a blank page or simply inserting ruled paper at the rear of the section.

Installation and Maintenance Notes:

INSTALLATION & MAINTENANCE LOG

INSTALLATION & MAINTENANCE LOG

INSTALLATION & MAINTENANCE LOG

CERTIFICATE OF ORIGIN

Equipment:	Centrifuge
Model:	DE-1000™ GBD, DE-1000™ FHD, DE-1000™ VFD
Characteristics:	0-600VAC, 50/60Hz, 3PH

Derrick Corporation acknowledges that the above set-forth product is manufactured in the United States of America as of the data of this certificate. This certificate is governed by the applicable purchase order terms in effect at the time of Derrick Corporation's original shipment of the referenced product.

Date: 29-December-2011

Signature: Jennifer J. Polanowski
Derrick Corporation

DERRICK® CORPORATION

CERTIFICATE OF QUALITY

Equipment:	Centrifuges
Model:	DE-1000™ GBD, DE-1000™ FHD, DE-1000™ VFD, DE-7200 VFD
Characteristics:	0-600VAC, 50/60Hz, 3PH

Derrick Corporation acknowledges that the above set-forth product conformed to the requirements for the applicable purchase order at the time of its original shipment by Derrick Corporation in that all construction materials and components were new and unused, were manufactured for this product, and that it was free of any known defects as to their design, material and workmanship. This certificate is governed by the applicable purchase order terms in effect at the time of Derrick Corporation's original shipment of the referenced product.

Jennifer J. Polanowski

Date: 29-December-2011

Signature: Jennifer J. Polanowski
Derrick Corporation

SHIPPING FINAL INSPECTION AND RUN TEST CERTIFICATE

Equipment:	Centrifuges
Model:	DE-1000™ GBD, DE-1000™ FHD, DE-1000™ VFD, DE-7200 VFD
Characteristics:	0-600VAC, 50/60Hz, 3PH

The product listed above was inspected and found to be in conformance with Derrick Corporation's internal coating, run test, and assembly inspection documents that were required for the type of equipment manufactured in accordance with the Derrick quality system. This certificate is governed by the applicable purchase order terms in effect at the time of Derrick Corporation's original shipment of the referenced product.

Date: 29-December-2011

Signature: Jennifer J. Polanowski
Derrick Corporation

Doc # PE-S-036-02-06
Date: 20-January-2011

CERTIFICATE OF CONFORMANCE

Equipment:	Mining & Oilfield equipment manufactured specifically for Hazardous Location Areas including but not limited to: Flo-Line® Cleaners, Flo-Line® Primers, Agitators, Vacu-Flo™ Degassers, DE-1000™ Centrifuges, Centrifugal Pumps, Flo-Line Scalpers™ etc.
Name and Address of Manufacturer:	Derrick Corporation 590 Duke Road Buffalo, NY 14225
Rating and Principle Characteristics:	0-600 VAC, 50/60Hz, 3PH
Model / Type Ref:	Various
Additional Information:	None

This product was found to be in conformance with:

U.L. listed for hazardous locations Class I, Division 1, Groups C & D, which is similar to equipment marked as II 2G Ex d IIB T3 for Zone 1 areas. Assembled in accordance with National Electrical Code (NEC) – articles 500 thru 506 (hazardous locations) where applicable.

Additionally:

Derrick Corporation certifies that the above-listed equipment for the referenced order conformed to the requirements of the specified order at the time of its original shipment by Derrick Corporation in that: all construction materials and components were new and unused, manufactured for this equipment, and that the goods were free of any known defects as to their design, material and workmanship. This certificate is governed by the applicable purchase order terms in effect at the time of Derrick Corporation's original shipment of the above-listed equipment.

DERRICK CORP. JAN 19 2012 ENGINEERING DEPT.

Signature: For Thomas Silvestrini

SEÇÃO 9 - REGISTOS DE INSTALAÇÃO E MANUTENÇÃO

OBJETIVO

Esta seção deve ser utilizada pelo pessoal de operação e manutenção para registrar informações históricas recolhidas durante a instalação e operação do equipamento Derrick. Se for devidamente mantido, o registro será útil para alterar os intervalos de manutenção e interceptar as tendências que podem indicar a necessidade de alterar procedimentos operacionais. Cada entrada no registro deve ser datada para futuras referências e monitoramento. Se necessário, páginas adicionais podem ser acrescentadas ao registo copiando-se uma página em branco ou simplesmente inserindo-se papel pautado na parte traseira da seção.

Notas de Instalação e Manutenção:

SEÇÃO 10 - DADOS DO FORNECEDOR

GERAL

Esta seção contém manuais, boletins, instruções e outros dados técnicos dos fabricantes para componentes instalados na centrífuga. Consulte a Seção 8 para os desenhos do conjunto Derrick, listas de peças e diagrama esquemático elétrico.

COMPONENTE	DESCRIÇÃO	DOCUMENTO
Acionador de Frequência Variável Allen-Bradley PowerFlex 700	Manual de Usuário Seção 4 e a Seção 1 páginas 1-13 & 1-14	*20B-UM002B-EN-P*
Motor de Acionamento do Recipiente & do transportador Marathon	Instruções de Instalação, Operações & Manutenção.	*SB181 6/2001*
Controle de Temperatura do Ar Condicionado Johnson	Instruções de Instalação & Operação	*997-349-7*
Ar Condicionado DTS	Solução de problemas	*10.99*
	Diagramas de Dados Técnicos e de Circuito	*Sem Número*
Demonstração do Gabinete de Tecnologias do Sistema de Drenagem	Instruções de Instalação, Operações & Manutenção.	*ML384*
	Manual do MiniDreno Tamanho 1	*ML306*
Absorvedor de Choque/Interruptor de Vibração Modelo VS2EX	Instruções de instalação	*VS-7037N*

Troubleshooting

Chapter 4 provides information to guide you in troubleshooting the PowerFlex 700. Included is a listing and description of drive faults (with possible solutions, when applicable) and alarms.

For information on...	See page...
Faults and Alarms	4-1
Drive Status	4-2
Manually Clearing Faults	4-4
Fault Descriptions	4-4
Clearing Alarms	4-9
Alarm Descriptions	4-10
Common Symptoms and Corrective Actions	4-13
Testpoint Codes and Functions	4-16

Faults and Alarms

A fault is a condition that stops the drive. There are three fault types.

Type	Fault Description	
①	Auto-Reset Run	When this type of fault occurs, and [Auto Rstrt Tries] (see page 3-30) is set to a value greater than "0," a user-configurable timer, [Auto Rstrt Delay] (see page 3-30) begins. When the timer reaches zero, the drive attempts to automatically reset the fault. If the condition that caused the fault is no longer present, the fault will be reset and the drive will be restarted.
②	Non-Resettable	This type of fault normally requires drive or motor repair. The cause of the fault must be corrected before the fault can be cleared. The fault will be reset on power up after repair.
③	User Configurable	These faults can be enabled/disabled to annunciate or ignore a fault condition.

An alarm is a condition that, if left untreated, may stop the drive. There are two alarm types.

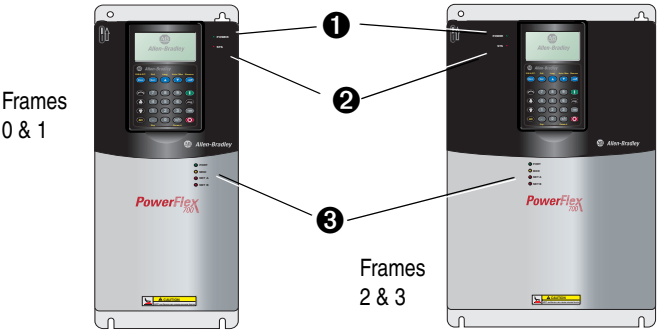
Type	Alarm Description	
①	User Configurable	These alarms can be enabled or disabled through [Alarm Config 1] on page 3-44.
②	Non-Configurable	These alarms are always enabled.

Drive Status

The condition or state of your drive is constantly monitored. Any changes will be indicated through the LEDs and/or the HIM (if present).

Front Panel LED Indications

Figure 4.1 Typical Drive Status Indicators



#	Name	Color	State	Description
1	PWR (Power)	Green	Steady	Illuminates when power is applied to the drive.
2	STS (Status)	Green	Flashing	Drive ready, but not running & no faults are present.
			Steady	Drive running, no faults are present.
		Yellow See page 4-10	Flashing, Drive Stopped	A start inhibit condition exists, the drive cannot be started. Check parameter 214 [Start Inhibits].
			Flashing, Drive Running	An intermittent type 1 alarm condition is occurring. Check parameter 211 [Drive Alarm 1].
			Steady, Drive Running	A continuous type 1 alarm condition exists. Check parameter 211 [Drive Alarm 1].
		Red See page 4-4	Flashing	Fault has occurred. Check [Fault x Code] or Fault Queue.
			Steady	A non-resettable fault has occurred.
3	PORT	Green	–	Status of DPI port internal communications (if present).
	MOD	Yellow	–	Status of communications module (when installed).
	NET A	Red	–	Status of network (if connected).
	NET B	Red	–	Status of secondary network (if connected).

Precharge Board LED Indications

Precharge Board LED indicators are found on Frame 5 & 6 drives. The LEDs are located above the "Line Type" jumper shown in Figure 1.2.

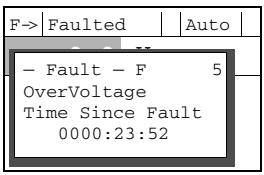
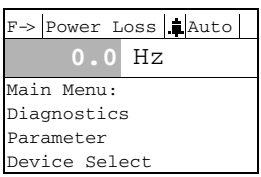
Name	Color	State	Description
Power	Green	Steady	Indicates when precharge board power supply is operational
Alarm	Yellow	Flashing	Number in "[ ]" indicates flashes and associated alarm(1):
		[1]	Low line voltage (<90%).
		[2]	Very low line voltage (<50%).
		[3]	Low phase (one phase <80% of line voltage).
		[4]	Frequency out of range or asymmetry (line sync failed).
		[5]	Low DC bus voltage (triggers ride-through operation).
		[6]	Input frequency momentarily out of range (40-65 Hz).
		[7]	DC bus short circuit detection active.
Fault	Red	Flashing	Number in "[ ]" indicates flashes and associated fault(2):
		[2]	DC bus short (Udc <2% after 20 ms).
		[4]	Line sync failed or low line (Uac <50% Unom).

(1) An alarm condition automatically resets when the condition no longer exists

(2) A fault indicates a malfunction that must be corrected and can only be reset after cycling power.

HIM Indication

The LCD HIM also provides visual notification of a fault or alarm condition.

Condition	Display
Drive is indicating a fault. The LCD HIM immediately reports the fault condition by displaying the following. • "Faulted" appears in the status line • Fault number • Fault name • Time that has passed since fault occurred Press Esc to regain HIM control.	
Drive is indicating an alarm. The LCD HIM immediately reports the alarm condition by displaying the following. • Alarm name (Type 2 alarms only) • Alarm bell graphic	

Manually Clearing Faults

Step	Key(s)
1. Press Esc to acknowledge the fault. The fault information will be removed so that you can use the HIM.	Esc
2. Address the condition that caused the fault. The cause must be corrected before the fault can be cleared.	
3. After corrective action has been taken, clear the fault by **one** of these methods. • Press Stop • Cycle drive power • Set parameter 240 [Fault Clear] to "1." • "Clear Faults" on the HIM Diagnostic menu.	

Fault Descriptions

Table 4.A Fault Types, Descriptions and Actions

Fault	No.	Type(1)	Description	Action
Analog In Loss	29	① ③	An analog input is configured to fault on signal loss. A signal loss has occurred. Configure with [Anlg In 1, 2 Loss] on page 3-52.	1. Check parameters. 2. Check for broken/loose connections at inputs.
Anlg Cal Chksum	108		The checksum read from the analog calibration data does not match the checksum calculated.	Replace drive.
Auto Rstrt Tries	33	③	Drive unsuccessfully attempted to reset a fault and resume running for the programmed number of [Flt RstRun Tries]. Enable/Disable with [Fault Config 1] on page 3-42.	Correct the cause of the fault and manually clear.
AutoTune Aborted	80		Autotune function was canceled by the user or a fault occurred.	Restart procedure.
Auxiliary Input	2	①	Auxiliary input interlock is open.	Check remote wiring.
Cntl Bd Overtemp	55		The temperature sensor on the Main Control Board detected excessive heat.	1. Check Main Control Board fan. 2. Check surrounding air temperature. 3. Verify proper mounting/cooling.
DB Resistance	69		Resistance of the internal DB resistor is out of range.	Replace resistor.

Fault	No.	Type(1)	Description	Action
Decel Inhibit	24	③	The drive is not following a commanded deceleration because it is attempting to limit bus voltage.	1. Verify input voltage is within drive specified limits. 2. Verify system ground impedance follows proper grounding techniques. 3. Disable bus regulation and/or add dynamic brake resistor and/or extend deceleration time. **Refer to the Attention statement on page P-4 for further info.**
Drive OverLoad	64		Drive rating of 110% for 1 minute or 150% for 3 seconds has been exceeded.	Reduce load or extend Accel Time.
Drive Powerup	49		No fault displayed. Used as a Power Up Marker in the Fault Queue indicating that the drive power has been cycled.	
Excessive Load	79		Motor did not come up to speed in the allotted time during autotune.	1. Uncouple load from motor. 2. Repeat Autotune.
Encoder Loss	91		Requires differential encoder. One of the 2 encoder channel signals is missing.	1. Check Wiring. 2. Replace encoder.
Encoder Quad Err	90		Both encoder channels changed state within one clock cycle.	1. Check for externally induced noise. 2. Replace encoder.
Faults Cleared	52		No fault displayed. Used as a marker in the Fault Queue indicating that the fault clear function was performed.	
Flt QueueCleared	51		No fault displayed. Used as a marker in the Fault Queue indicating that the clear queue function was performed.	
FluxAmpsRef Rang	78		The value for flux amps determined by the Autotune procedure exceeds the programmed [Motor NP FLA].	1. Reprogram [Motor NP FLA] with the correct motor nameplate value. 2. Repeat Autotune.
Ground Fault	13	①	A current path to earth ground greater than 25% of drive rating.	Check the motor and external wiring to the drive output terminals for a grounded condition.
Hardware Fault	93		Hardware enable is disabled (jumpered high) but logic pin is still low.	1. Check jumper. 2. Replace Main Control Board.
Hardware Fault	130		Gate array load error.	1. Cycle power. 2. Replace Main Control Board.
Hardware Fault	131		Dual port failure.	1. Cycle power. 2. Replace Main Control Board.
Hardware PTC	18		Motor PTC (Positive Temperature Coefficient) Overtemp.	
Heatsink OvrTemp	8	①	Heatsink temperature exceeds 100% of [Drive Temp].	1. Verify that maximum ambient temperature has not been exceeded. 2. Check fan. 3. Check for excess load.

Fault	No.	Type(1)	Description	Action
HW OverCurrent	12	①	The drive output current has exceeded the hardware current limit.	Check programming. Check for excess load, improper DC boost setting, DC brake volts set too high or other causes of excess current.
Incompat MCB-PB	106	②	Drive rating information stored on the power board is incompatible with the main control board.	Load compatible version files into drive.
I/O Comm Loss	121		I/O Board lost communications with the Main Control Board.	Check connector. Check for induced noise. Replace I/O board or Main Control Board.
I/O Failure	122		I/O was detected, but failed the powerup sequence.	Replace Main Control Board.
Input Phase Loss	17		The DC bus ripple has exceeded a preset level.	Check incoming power for a missing phase/blown fuse.
IR Volts Range	77		"Calculate" is the autotune default and the value determined by the autotune procedure for IR Drop Volts is not in the range of acceptable values.	Re-enter motor nameplate data.
IXo VoltageRange	87		Voltage calculated for motor inductive impedance exceeds 25% of [Motor NP Volts].	1. Check for proper motor sizing. 2. Check for correct programming of [Motor NP Volts], parameter 41. 3. Additional output impedance may be required.
Load Loss	15		Drive output torque current is below [Load Loss Level] for a time period greater than [Load Loss time].	1. Verify connections between motor and load. 2. Verify level and time requirements.
Motor Overload	7	① ③	Internal electronic overload trip. Enable/Disable with [Fault Config 1] on page 3-42.	An excessive motor load exists. Reduce load so drive output current does not exceed the current set by [Motor NP FLA].
Motor Thermistor	16		Thermistor output is out of range.	1. Verify that thermistor is connected. 2. Motor is overheated. Reduce load.
NVS I/O Checksum	109		EEprom checksum error.	1. Cycle power and repeat function. 2. Replace Main Control Board.
NVS I/O Failure	110		EEprom I/O error.	1. Cycle power and repeat function. 2. Replace Main Control Board.
Output PhaseLoss	21		Current in one or more phases has been lost or remains below a preset level.	Check the drive and motor wiring. Check for phase-to-phase continuity at the motor terminals. Check for disconnected motor leads.

Fault	No.	Type(1)	Description	Action
OverSpeed Limit	25	①	Functions such as Slip Compensation or Bus Regulation have attempted to add an output frequency adjustment greater than that programmed in [Overspeed Limit].	Remove excessive load or overhauling conditions or increase [Overspeed Limit].
OverVoltage	5	①	DC bus voltage exceeded maximum value.	Monitor the AC line for high line voltage or transient conditions. Bus overvoltage can also be caused by motor regeneration. Extend the decel time or install dynamic brake option.
Parameter Chksum	100	②	The checksum read from the board does not match the checksum calculated.	1. Restore defaults. 2. Reload User Set if used.
Params Defaulted	48		The drive was commanded to write default values to EEPROM.	1. Clear the fault or cycle power to the drive. 2. Program the drive parameters as needed.
Phase U to Grnd	38		A phase to ground fault has been detected between the drive and motor in this phase.	1. Check the wiring between the drive and motor. 2. Check motor for grounded phase. 3. Replace drive.
Phase V to Grnd	39			
Phase W to Grnd	40			
Phase UV Short	41		Excessive current has been detected between these two output terminals.	1. Check the motor and drive output terminal wiring for a shorted condition. 2. Replace drive.
Phase VW Short	42			
Phase UW Short	43			
Port 1-5 DPI Loss	81-85	②	DPI port stopped communicating. A SCANport device was connected to a drive operating DPI devices at 500k baud.	1. If adapter was not intentionally disconnected, check wiring to the port. Replace wiring, port expander, adapters, Main Control Board or complete drive as required. 2. Check HIM connection. 3. If an adapter was intentionally disconnected and the [Logic Mask] bit for that adapter is set to "1", this fault will occur. To disable this fault, set the [Logic Mask] bit for the adapter to "0."
Port 1-5 Adapter	71-75		The communications card has a fault.	1. Check DPI device event queue and corresponding fault information for the device.
Power Loss	3	① ③	DC bus voltage remained below 85% of nominal for longer than [Power Loss Time]. Enable/ Disable with [Fault Config 1] on page 3-42.	Monitor the incoming AC line for low voltage or line power interruption.

Fault	No.	Type(1)	Description	Action
Power Unit	70		One or more of the output transistors were operating in the active region instead of desaturation. This can be caused by excessive transistor current or insufficient base drive voltage.	1. Check for damaged output transistors. 2. Replace drive.
Pulse In Loss	92		Z Channel is selected as a pulse input and no signal is present.	1. Check wiring. 2. Replace pulse generator.
Pwr Brd Chksum1	104		The checksum read from the EEPROM does not match the checksum calculated from the EEPROM data.	Clear the fault or cycle power to the drive.
Pwr Brd Chksum2	105	②	The checksum read from the board does not match the checksum calculated.	1. Cycle power to the drive. 2. If problem persists, replace drive.
Replaced MCB-PB	107	②	Main Control Board was replaced and parameters were not programmed.	1. Restore defaults. 2. Reprogram parameters.
See Manual	28		Encoderless TorqProve has been enabled but user has not read and understood application concerns of encoderless operation.	1. Read the “Attention” on page C-5 relating to the use of TorqProve with no encoder.
Shear Pin	63	③	Programmed [Current Lmt Val] has been exceeded. Enable/ Disable with [Fault Config 1] on page 3-42.	Check load requirements and [Current Lmt Val] setting.
Software Fault	88		Microprocessor handshake error.	Replace Main Control Board.
Software Fault	89		Microprocessor handshake error.	Replace Main Control Board.
SW OverCurrent	36	①	Drive output current has exceeded the 1ms current rating. This rating is greater than the 3 second current rating and less than the hardware overcurrent fault level. It is typically 200- 250% of the drive continuous rating	Check for excess load, improper DC boost setting. DC brake volts set too high.
TorqPrv Spd Band	20		Difference between [Commanded Speed] and [Encoder Speed] has exceeded the level set in [Spd Dev Band] for a time period greater than [Spd Band Integrat].	1. Check wiring between drive and motor. 2. Check release of mechanical brake.
Trnsistr OvrTemp	9	①	Output transistors have exceeded their maximum operating temperature.	1. Verify that maximum ambient temperature has not been exceeded. 2. Check fan. 3. Check for excess load.

Fault	No.	Type(1)	Description	Action
UnderVoltage	4	① ③	DC bus voltage fell below the minimum value of 407V DC at 400/480V input or 204V DC at 200/240V input. Enable/Disable with [Fault Config 1] (page 3-42).	Monitor the incoming AC line for low voltage or power interruption.
UserSet1 Chksum	101	②	The checksum read from the user set does not match the checksum calculated.	Re-save user set.
UserSet2 Chksum	102	②		
UserSet3 Chksum	103	②		

(1) See page 4-1 for a description of fault types.

Table 4.B Fault Cross Reference

No.(1)	Fault
2	Auxiliary Input
3	Power Loss
4	UnderVoltage
5	OverVoltage
7	Motor Overload
8	Heatsink OvrTemp
9	Trnsistr OvrTemp
12	HW OverCurrent
13	Ground Fault
15	Load Loss
16	Motor Thermistor
17	Input Phase Loss
20	TorqPrv Spd Band
21	Output PhaseLoss
24	Decel Inhibit
25	OverSpeed Limit
28	See Manual
29	Analog In Loss
33	Auto Rstrt Tries
36	SW OverCurrent

No.(1)	Fault
38	Phase U to Grnd
39	Phase V to Grnd
40	Phase W to Grnd
41	Phase UV Short
42	Phase VW Short
43	Phase UW Short
48	Params Defaulted
49	Drive Powerup
51	Flt QueueCleared
52	Faults Cleared
55	Cntl Bd Overtemp
63	Shear Pin
64	Drive OverLoad
69	DB Resistance
70	Power Unit
71- 75	Port 1-5 Adapter
77	IR Volts Range
78	FluxAmpsRef Rang
79	Excessive Load
80	AutoTune Aborted

No.(1)	Fault
81- 85	Port 1-5 DPI Loss
87	IXo VoltageRange
88	Software Fault
89	Software Fault
90	Encoder Quad Err
91	Encoder Loss
92	Pulse In Loss
93	Hardware Fault
100	Parameter Chksum
101-103	UserSet Chksum
104	Pwr Brd Chksum1
105	Pwr Brd Chksum2
106	Incompat MCB-PB
107	Replaced MCB-PB
108	Anlg Cal Chksum
120	I/O Mismatch
121	I/O Comm Loss
122	I/O Failure
130	Hardware Fault
131	Hardware Fault

(1) Fault numbers not listed are reserved for future use.

Clearing Alarms

Alarms are automatically cleared when the condition that caused the alarm is no longer present.

Alarm Descriptions

Table 4.C Alarm Descriptions and Actions

Alarm	No.	Type[1]	Description
AdjVoltRef Cflct	33	①	Invalid adjustable voltage reference selection conflict.
Analog In Loss	5	①	An analog input is configured for "Alarm" on signal loss and signal loss has occurred.
Bipolar Conflict	20	②	Parameter 190 [Direction Mode] is set to "Bipolar" or "Reverse Dis" and one or more of the following digital input functions is configured: "Fwd/Reverse," "Run Forward," "Run Reverse," "Jog Forward" or "Jog Reverse."
Brake Slipped	32	②	Encoder movement has exceeded the level in [BrkSlipCount] after the brake was set.
Decel Inhibt	10	①	Drive is being inhibited from decelerating.
Dig In ConflictA	17	②	Digital input functions are in conflict. Combinations marked with a "." will cause an alarm.

	Acc2/Dec2	Accel 2	Decel 2	Jog 1/2	Jog Fwd	Jog Rev	Fwd/Rev
Acc2/Dec2		.	.				
Accel 2	.						
Decel 2	.						
Jog 1/2					.	.	
Jog Fwd				.			.
Jog Rev				.			.
Fwd/Rev					.	.	

Dig In ConflictB	18	②	A digital Start input has been configured without a Stop input or other functions are in conflict. Combinations that conflict are marked with a "." and will cause an alarm.

	Start	Stop-CF	Run	Run Fwd	Run Rev	Jog 1/2	Jog Fwd	Jog Rev	Fwd/Rev
Start			.	.	.		.	.	
Stop-CF									
Run	.			.	.		.	.	
Run Fwd	.		.			.			.
Run Rev	.		.			.			.
Jog 1/2				.	.				
Jog Fwd	.		.						
Jog Rev	.		.						
Fwd/Rev				.	.				

Dig In ConflictC	19	②	More than one physical input has been configured to the same input function. Multiple configurations are not allowed for the following input functions.

Forward/Reverse
Speed Select 1
Speed Select 2
Speed Select 3
Run Forward
Run Reverse
Jog Forward
Jog Reverse
Run
Stop Mode B
Bus Regulation Mode B
Acc2 / Dec2
Accel 2
Decel 2

Alarm	No.	Type(1)	Description
Drive OL Level 1	8	①	The calculated IGBT temperature requires a reduction in PWM frequency. If [Drive OL Mode] is disabled and the load is not reduced, an overload fault will eventually occur.
Drive OL Level 2	9	①	The calculated IGBT temperature requires a reduction in Current Limit. If [Drive OL Mode] is disabled and the load is not reduced, an overload fault will eventually occur.
FluxAmpsRef Rang	26	②	The calculated or measured Flux Amps value is not within the expected range. Verify motor data and rerun motor tests.
Ground Warn	15	①	Ground current has exceeded the level set in [Gnd Warn Level].
Home Not Set	34	①	Configurable alarm set in parameter 259, bit 17. When set to "1," this alarm is displayed when any of the following occur: • parameter 88 is set to "7" (Pos/Spd Prof) • on power up and parameter 88 = "7" • recall user sets and parameter 88 = "7" Alarm is cleared when: • setting parameter 88 to a value other than "7" • reset defaults • parameter 259, bit 17 is cleared • a digital input is configured as "Set Home" and input is True • parameter 705, bit 9 is "Enabled" • parameter 700, bit 13 (At Home) is "Enabled" - position regulator will set this bit if device is "home"
In Phase Loss	13	①	The DC bus ripple has exceeded the level in [Phase Loss Level].
IntDBRes OvrHeat	6	①	The drive has temporarily disabled the DB regulator because the resistor temperature has exceeded a predetermined value.
IR Volts Range	25	②	The drive auto tuning default is "Calculate" and the value calculated for IR Drop Volts is not in the range of acceptable values. This alarm should clear when all motor nameplate data is properly entered.
Ixo Vlt Rang	28	②	Motor leakage inductance is out of range.
Load Loss	14		Output torque current is below [Load Loss Level] for a time period greater than [Load Loss time].
MaxFreq Conflict	23	②	The sum of [Maximum Speed] and [Overspeed Limit] exceeds [Maximum Freq]. Raise [Maximum Freq] or lower [Maximum Speed] and/or [Overspeed Limit] so that the sum is less than or equal to [Maximum Freq].
Motor Thermistor	12		The value at the thermistor terminals has been exceeded.
Motor Type Cflct	21	②	[Motor Type] has been set to "Synchr Reluc" or "Synchr PM" and one or more of the following exist: • [Torque Perf Mode] = "Sensrls Vect," "SV Economize" or "Fan/Pmp V/Hz." • [Flux Up Time] is greater than 0.0 Secs. • [Speed Mode] is set to "Slip Comp." • [Autotune] = "Static Tune" or "Rotate Tune."
NP Hz Conflict	22	②	Fan/pump mode is selected in [Torq Perf Mode] and the ratio of [Motor NP Hertz] to [Maximum Freq] is greater than 26.
PI Config Conflict	52	②	Check [PI Configuration], both "AdjVoltTrim" & "Torque Trim" are selected.

Alarm	No.	Type(1)	Description
Power Loss	3	①	Drive has sensed a power line loss.
Precharge Active	1	①	Drive is in the initial DC bus precharge state.
Prof Step Cflct	50	②	An error is detected in trend step(s). • Set if Sleep Mode is enabled. • Set if: any profile step uses “Encoder Incr” and/or “Enc Absolute” *and* [Motor Cntl Sel], parameter 53 is not set to “FVC Vector” *and* [Feedback Select], parameter 80 is not set to “Encoder” or “Simulator” *and* [Speed/Torque Mod], parameter 88 = “7” (Pos/Spd Prof). • a Step Type is configured for “Dig Input” and the Step Value is greater than 6, less than –6, or zero *or* the digital input selected with [Digital Inx Sel] is not set to “57, Prof Input.” • Cleared if none of the above occur.
PTC Conflict	31	②	PTC is enabled for Analog In 1, which is configured as a 0-20 mA current source in [Anlg In Config].
Sleep Config	29	②	Sleep/Wake configuration error. With [Sleep-Wake Mode] = “Direct,” possible causes include: drive is stopped and [Wake Level] < [Sleep Level]. “Stop=CF,” “Run,” “Run Forward,” or “Run Reverse.” is not configured in [Digital Inx Sel].
Speed Ref Cflct	27	②	[Speed Ref x Sel] or [PI Reference Sel] is set to “Reserved”.
Start At PowerUp	4	①	[Start At PowerUp] is enabled. Drive may start at any time within 10 seconds of drive powerup.
TB Man Ref Cflct	30	②	Occurs when: • “Auto/Manual” is selected (default) for [Digital In3 Sel], parameter 363 *and* • [TB Man Ref Sel], parameter 96 has been reprogrammed. No other use for the selected analog input may be programmed. Example: If [TB Man Ref Sel] is reprogrammed to “Analog In 2,” all of the factory default uses for “Analog In 2” must be reprogramed (such as parameters 90, 117, 128 and 179). See also Auto/Manual Examples on page 1-22. To correct: • Verify/reprogram the parameters that reference an analog input *or* • Reprogram [Digital In3] to another function or “Unused.”
TorqProve Cflct	49	②	When [TorqProve Cnfg] is enabled, [Motor Cntl Sel], [Feedback Select] and [Motor Fdbk Type] must be properly set (refer to page C-7).
UnderVoltage	2	①	The bus voltage has dropped below a predetermined value.
VHz Neg Slope	24	②	[Torq Perf Mode] = “Custom V/Hz” & the V/Hz slope is negative.
Waking	11	①	The Wake timer is counting toward a value that will start the drive.

(1) See page 4-1 for a description of alarm types.

Table 4.D Alarm Cross Reference

No.(1)	Alarm
1	Precharge Active
2	UnderVoltage
3	Power Loss
4	Start At PowerUp
5	Analog in Loss
6	IntDBRes OvrHeat
8	Drive OL Level 1
9	Drive OL Level 2
10	Decel Inhibt
11	Waking
12	Motor Thermistor
13	In Phase Loss

No.(1)	Alarm
14	Load Loss
15	Ground Warn
17	Dig In ConflictA
18	Dig In ConflictB
19	Dig In ConflictC
20	Bipolar Conflict
21	Motor Type Cflct
22	NP Hz Conflict
23	MaxFreq Conflict
24	VHz Neg Slope
25	IR Volts Range
26	FluxAmpsRef Rang

No.(1)	Alarm
27	Speed Ref Cflct
28	Ixo Vlt Rang
29	Sleep Config
30	TB Man Ref Cflct
31	PTC Conflict
32	Brake Slipped
33	AdjVoltRef Cflct
34	Home Not Set
49	Torq Prove Cflct
50	Prof Step Cflct
52	PI Config Conflict

(1) Alarm numbers not listed are reserved for future use.

Common Symptoms and Corrective Actions

Drive does not Start from Start or Run Inputs wired to the terminal block.

Cause(s)	Indication	Corrective Action
Drive is Faulted	Flashing red status light	Clear fault. • Press Stop • Cycle power • Set [Fault Clear] to 1 (See page 3-42) • “Clear Faults” on the HIM Diagnostic menu.
Incorrect input wiring. See pages 1-19 & 1-20 for wiring examples. • 2 wire control requires Run, Run Forward, Run Reverse or Jog input. • 3 wire control requires Start and Stop inputs. • Jumper from terminal 25 to 26 is required.	None	Wire inputs correctly and/or install jumper.
Incorrect digital input programming. • Mutually exclusive choices have been made (i.e., Jog and Jog Forward). • 2 wire and 3 wire programming may be conflicting. • Exclusive functions (i.e, direction control) may have multiple inputs configured. • Stop is factory default and is not wired.	None	Program [Digital Inx Sel] for correct inputs. (See page 3-55) Start or Run programming may be missing.
	Flashing yellow status light and “DigIn CflctB” indication on LCD HIM. [Drive Status 2] shows type 2 alarm(s).	Program [Digital Inx Sel] to resolve conflicts. (See page 3-55) Remove multiple selections for the same function. Install stop button to apply a signal at stop terminal.

Drive does not Start from HIM.

Cause(s)	Indication	Corrective Action
Drive is programmed for 2 wire control. HIM Start button is disabled for 2 wire control.	None	If 2 wire control is required, no action needed. See [Save HIM Ref] on page 3-34. If 3 wire control is required, program [Digital Inx Sel] for correct inputs. (See page 3-55)

Drive does not respond to changes in speed command.

Cause(s)	Indication	Corrective Action
No value is coming from the source of the command.	LCD HIM Status Line indicates "At Speed" and output is 0 Hz.	1. If the source is an analog input, check wiring and use a meter to check for presence of signal. 2. Check [Commanded Speed] for correct source. (See page 3-7)
Incorrect reference source has been programmed.	None	3. Check [Speed Ref Source] for the source of the speed reference. (See page 3-39) 4. Reprogram [Speed Ref A Sel] for correct source. (See page 3-19)
Incorrect Reference source is being selected via remote device or digital inputs.	None	5. Check [Drive Status 1], page 3-37, bits 12 and 13 for unexpected source selections. 6. Check [Dig In Status], page 3-40 to see if inputs are selecting an alternate source. 7. Reprogram digital inputs to correct "Speed Sel x" option. (See page 3-55)

Motor and/or drive will not accelerate to commanded speed.

Cause(s)	Indication	Corrective Action
Acceleration time is excessive.	None	Reprogram [Accel Time x]. (See page 3-26)
Excess load or short acceleration times force the drive into current limit, slowing or stopping acceleration.	None	Check [Drive Status 2], bit 10 to see if the drive is in Current Limit. (See page 3-37) Remove excess load or reprogram [Accel Time x].(See page 3-26)
Speed command source or value is not as expected.	None	Check for the proper Speed Command using Steps 1 through 7 above.
Programming is preventing the drive output from exceeding limiting values.	None	Check [Maximum Speed] (See page 3-17) and [Maximum Freq] (See page 3-10) to assure that speed is not limited by programming.

Motor operation is unstable.

Cause(s)	Indication	Corrective Action
Motor data was incorrectly entered or Autotune was not performed.	None	1. Correctly enter motor nameplate data. 2. Perform "Static" or "Rotate" Autotune procedure. (Param #061, page 3-12)

Drive will not reverse motor direction.

Cause(s)	Indication	Corrective Action
Digital input is not selected for reversing control.	None	Check [Digital Inx Sel], page 3-55. Choose correct input and program for reversing mode.
Digital input is incorrectly wired.	None	Check input wiring. (See page 1-15)
Direction mode parameter is incorrectly programmed.	None	Reprogram [Direction Mode], page 3-33 for analog "Bipolar" or digital "Unipolar" control.
Motor wiring is improperly phased for reverse.	None	Switch two motor leads.
A bipolar analog speed command input is incorrectly wired or signal is absent.	None	1. Use meter to check that an analog input voltage is present. 2. Check wiring. (See page 1-15) Positive voltage commands forward direction. Negative voltage commands reverse direction.

Stopping the drive results in a Decel Inhibit fault.

Cause(s)	Indication	Corrective Action
The bus regulation feature is enabled and is halting deceleration due to excessive bus voltage. Excess bus voltage is normally due to excessive regenerated energy or unstable AC line input voltages. Internal timer has halted drive operation.	Decel Inhibit fault screen. LCD Status Line indicates "Faulted".	1. See Attention statement on page P-4. 2. Reprogram parameters 161/162 to eliminate any "Adjust Freq" selection. 3. Disable bus regulation (parameters 161 & 162) and add a dynamic brake. 4. Correct AC input line instability or add an isolation transformer. 5. Reset drive.

Testpoint Codes and Functions

Select testpoint with [Testpoint x Sel], parameters 234/236. Values can be viewed with [Testpoint x Data], parameters 235/237.

No.(1)	Description	Units	Values		
			Minimum	Maximum	Default
01	DPI Error Status	1	0	255	0
02	Heatsink Temp	0.1 degC	–100.0	100.0	0
03	Active Cur Limit	1	0	32767	0
04	Active PWM Freq	1 Hz	2	10	4
05	Life MegaWatt Hr(2)	0.0001 MWh	0	214748.3647	0
06	Life Run Time	0.0001 Hrs	0	214748.3647	0
07	Life Pwr Up Time	0.0001 Hrs	0	214748.3647	0
08	Life Pwr Cycles	1	0	4294967295	0
09	Life MW-HR Fract(2)	1	0	4294967295	0
10	MW-HR Frac Unit(2)	1	0	4294967295	0
11	MCB Life Time	0.0001 Hrs	0	214748.3647	0
12	Raw Analog In 1	1	0		0
13	Raw Analog In 2	1	0		0
16	CS Msg Rx Cnt	1	0	65535	0
17	CS Msg Tx Cnt	1	0	65535	0
18	CS Timeout Cnt	1	0	255	0
19	CS Msg Bad Cnt	1	0	255	0
22	PC Msg Rx Cnt	1	0	65535	0
23	PC Msg Tx Cnt	1	0	65535	0
24-29	PC1-6 Timeout Cnt	1	0	255	0
30	CAN BusOff Cnt	1	0	65535	0
31	No. of Analog Inputs	1	0	x	0
32	Raw Temperature	1	0	65535	0
33	MTO Norm Mtr Amp	0.1 Amps	0	65535	0
34	DTO-Cmd Frequency	1	0	420	0
35	DTO-Cmd Cur Lim	0.1	0		0
36	DTO-Cmd DC Hold	1	0	32767	0
37	Control Bd Temp	0.1	0.0	60.0	0.0

(1) Enter in [Testpoint x Sel].

(2) Use the equation below to calculate total Lifetime MegaWatt Hours.

$$\left(\frac{\text{Value of Code 9}}{\text{Value of Code 10}} \times 0.1\right) + \text{Value of Code 5} = \text{Total Lifetime MegaWatt Hours}$$

Bypass Contactor Precaution

ATTENTION: An incorrectly applied or installed bypass system can result in component damage or reduction in product life. The most common causes are:

- Wiring AC line to drive output or control terminals.
- Improper bypass or output circuits not approved by Allen-Bradley.
- Output circuits which do not connect directly to the motor.

Contact Allen-Bradley for assistance with application or wiring.

Disconnecting MOVs and Common Mode Capacitors

PowerFlex 700 drives contain protective MOVs and common mode capacitors that are referenced to ground. To guard against drive damage, these devices must be disconnected if the drive is installed on a resistive grounded distribution system or an ungrounded distribution system where the line-to-ground voltages on any phase could exceed 125% of the nominal line-to-line voltage. To disconnect these devices, remove the jumper(s) listed in Table 1.D. Jumpers can be removed by carefully pulling the jumper straight out. See *Wiring and Grounding Guidelines for PWM AC Drives*, publication DRIVES-IN001 for more information on ungrounded systems.

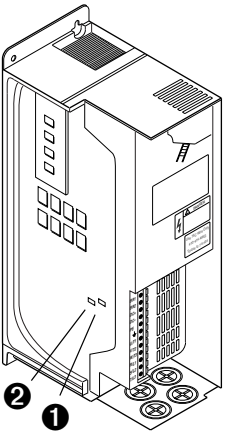
ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before removing/installing jumpers. Measure the DC bus voltage at the +DC & –DC terminals of the Power Terminal Block. The voltage must be zero.

Table 1.D Jumper Removal (1)

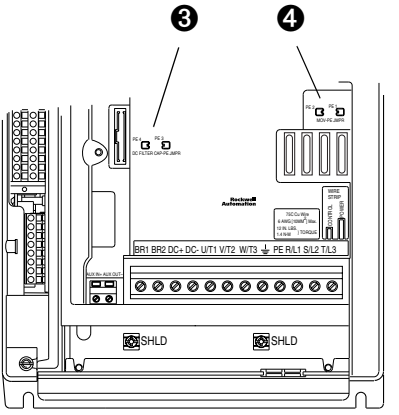
Frame	Jumper	Component	Jumper Location	No.
0, 1	PEA	Common Mode Cap.	Remove the I/O Cassette (page 1-16). Jumpers located on the Power Board (Figure 1.5).	❶
	PEB	MOV's		❷
2-4	PEA	Common Mode Cap.	Jumpers are located above the Power Terminal Block (see Figure 1.5).	❸
	PEB	MOV's		❹
5	Wire	Common Mode Cap.	Remove the I/O Cassette as described on page 1-16. The green/yellow jumper is located on the back of chassis (see Figure 1.5 for location). Disconnect, insulate and secure the wire to guard against unintentional contact with chassis or components.	❺
		MOV's Input Filter Cap.	Note location of the two green/yellow jumper wires next to the Power Terminal Block (Figure 1.5). Disconnect, insulate and secure the wires to guard against unintentional contact with chassis or components.	❻
6	Wire	Common Mode Cap. MOV's Input Filter Cap.	Remove the wire guard from the Power Terminal Block. Disconnect the three green/yellow wires from the two "PE" terminals shown in Figure 1.4. Insulate/secure the wires to guard against unintentional contact with chassis or components.	

(1) **Important:** Do Not remove jumpers if the distribution system is grounded.

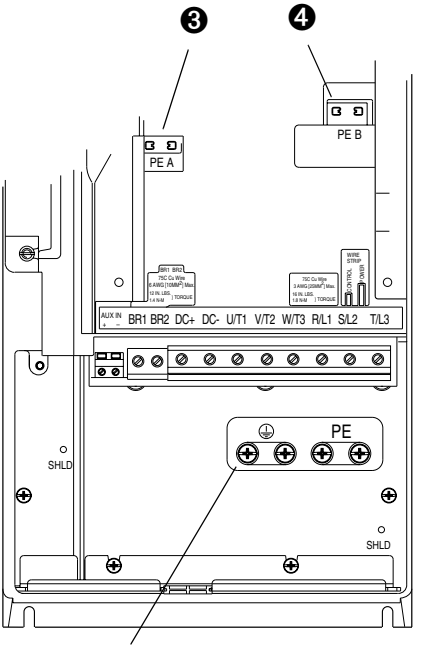
Figure 1.5 Typical Jumper Locations (see Table 1.D for description)



Frames 0 & 1
(I/O Cassette Removed)

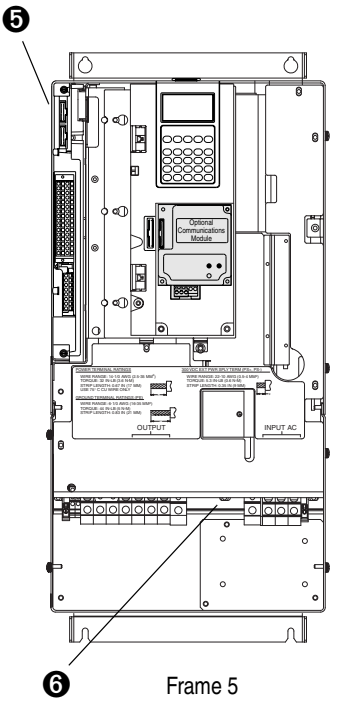


Frame 2



Important: Do Not discard or replace grounding hardware.

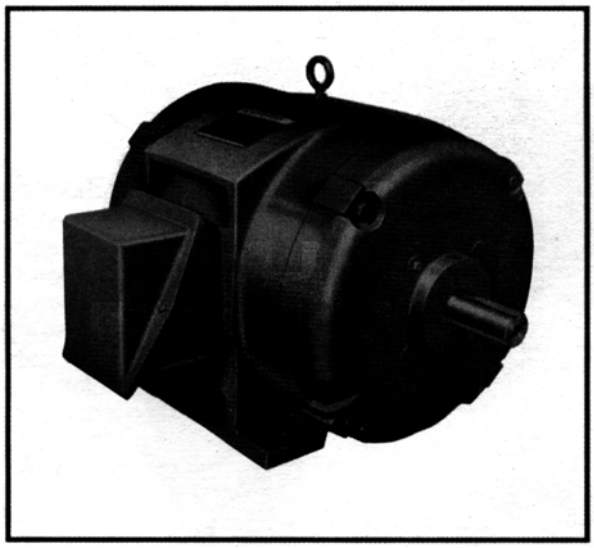
Frames 3 & 4

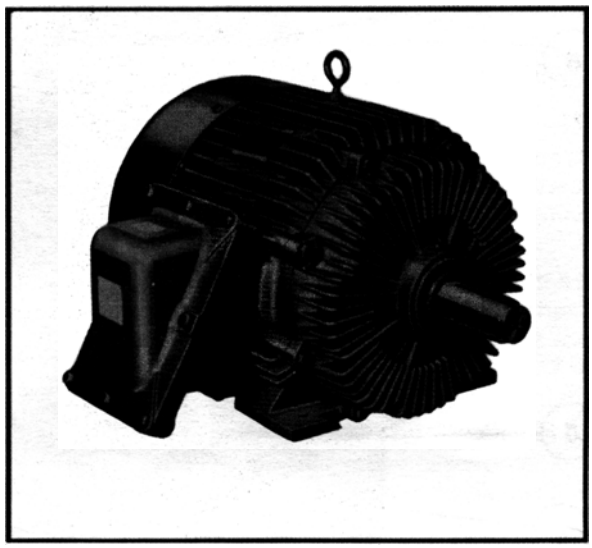


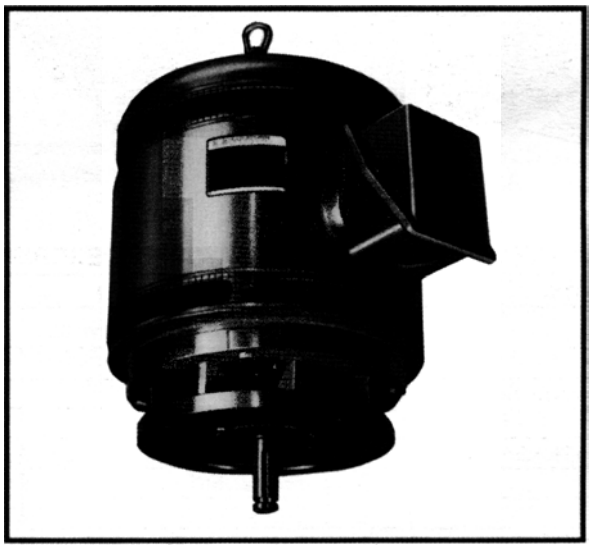
Frame 5

MARATHON® ELECTRIC

Standard Induction Motors

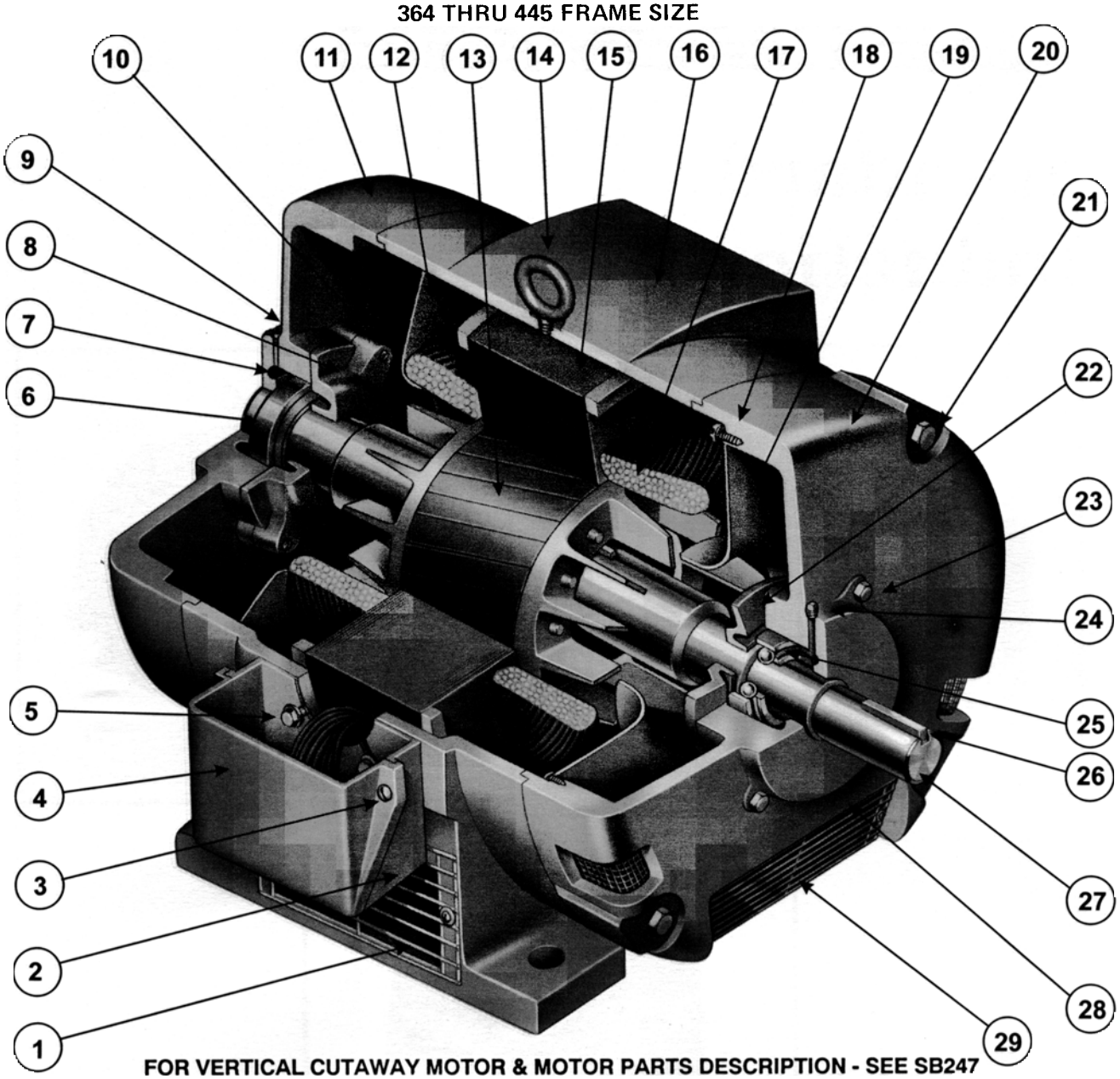






Installation, Operation, & Maintenance Instructions

TYPICAL CUTAWAY VIEW
OF A MARATHON DESIGNED, DRIPPROOF, HORIZONTAL
INTEGRAL HORSEPOWER MOTOR & PARTS DESCRIPTION
364 THRU 445 FRAME SIZE



FOR VERTICAL CUTAWAY MOTOR & MOTOR PARTS DESCRIPTION - SEE SB247

ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION
1.	** Frame Vent Screen	11.	Bracket O.P.E.	21.	Bracket Holding Bolt
2.	Conduit Box Bottom	12.	Baffle Plate O.P.E.	22.	Inner Bearing Cap P.E.
3.	Conduit Box Top-Holding Screw	13.	Rotor Core	23.	Inner Bearing Cap Bolt
4.	Conduit Box Top	14.	Lifting Eye Bolt	24.	Grease Plug
5.	Conduit Box Bottom-Holding Bolt	15.	Stator Core	25.	*Ball Bearing P.E.
6.	*Ball Bearing O.P.E.	16.	Frame	26.	Shaft Extention Key
7.	Pre-loading Spring	17.	Stator Winding	27.	Shaft
8.	Inner Bearing Cap O.P.E.	18.	Baffel Plate Holding Screw	28.	Drain Plug (grease)
9.	Grease Plug	19.	Baffle Plate P.E.	29.	** Bracket Screen
10.	Inner Bearing Cap Bolt	20.	Bracket P.E.		

P.E. = Pulley End
O.P.E. = Opposite Pulley End
* = Bearing Numbers are shown on motor nameplate when requesting information or parts always give complete motor description, model and serial numbers.
** = Bracket and frame screens are optional.

WARNING

These instructions must be followed to ensure safe and proper installation, operation and maintenance of the motor. They should be brought to the attention of all persons who install, operate or maintain this equipment.

GENERAL INFORMATION

Marathon Electric motors are all fully factory tested and inspected before shipping. Damage during shipment and storage can occur. Motors not correctly matched to the power supply and/or the load will not operate properly. These instructions are intended as a guide to identify and eliminate these problems before they are overlooked or cause further damage.

ACCEPTANCE

Check carefully for any damage that may have occurred in transit. If any damage or shortage is discovered, do not accept until an appropriate notation on the freight bill is made. Any damage discovered after receipt of equipment should be immediately reported to the carrier.

STORAGE

A. Keep motors clean
   1. Store indoors
   2. Keep covered to eliminate airborne dust and dirt.
   3. Cover openings for ventilation, conduit connections, etc. to prevent entry of rodents, snakes, birds, and insects, etc.

B. Keep motors dry
   1. Store in a dry area indoors
   2. Temperature swings should be minimal to prevent condensation.
   3. Space heaters are recommended to prevent condensation.
   4. Treat unpainted flanges, shafts, and fittings with a rust inhibitor.
   5. Check insulation resistance before putting motor into service. (Consult manufacturer for guidelines).

C. Keep Bearings Lubricated
   1. Once per month, rotate shaft several turns to distribute grease in bearings.
   2. If unit has been stored more than one year, add grease before start-up. (Refer to lubrication procedure).

INSTALLATION

UNCRATING AND INSPECTION

After uncrating, check for any damage which may have been incurred in handling. The motor shaft should turn freely by hand. Repair or replace any loose or broken parts before attempting to use the motor.

Check to be sure that motor has not been exposed to dirt, grit, or excessive moisture in shipment or storage before installation.

Measure insulation resistance (see operation). Clean and dry the windings as required.

Never start a motor which has been wet without having it thoroughly dried.

SAFETY

Motors should be installed, protected and fused in accordance with latest issue of National Electrical Code, NEMA Standard Publication No. MG 2 and local codes.

Eyebolts or lifting lugs are intended for lifting the motor only. These lifting provisions should never be used when lifting or handling the motor with other equipment (i.e. pumps, gear boxes, fans or other driven equipment) as a single unit. Be sure the eyebolt is fully threaded and tight in its mounting hole.

Eyebolt lifting capacity ratings is based on a lifting alignment coincident with the eyebolt centerline. Eyebolt capacity reduces as deviation from this alignment increases. See NEMA MG 2.

Frames and accessories of motors should be grounded in accordance with National Electrical Code (NEC) Article 430. For general information of grounding refer to NEC Article 250.

Rotating parts such as pulleys, couplings, external fans, and shaft extensions should be permanently guarded.

LOCATION

In selecting a location for the motor, consideration should be given to environment and ventilation. A motor with the proper enclosure for the expected operating condition should be selected.

The ambient temperature of the air surrounding the motor should not exceed 40°C (104°F) unless the motor has been especially designed for high ambient temperature applications. The free flow of air around the motor should not be obstructed.

The motor should never be placed in a room with a hazardous process, or where flammable gases or combustible material may be present, unless it it specifically designed for this type of service.

1. Dripproof (open) motors are intended for use indoors where atmosphere is relatively clean, dry and non-corrosive.
2. Dripproof (open) fire pump motors are to be installed in a Type 2 dripproof environment as defined in NEMA 250.
3. Totally enclosed motors may be installed where dirt, moisture and corrosion are present, or in outdoor locations.
4. Explosion proof motors are built for use in hazardous locations as indicated by Underwriters' label on motor. Consult UL, NEC, and local codes for guidance.

Refer to Marathon Electric for application assistance.

FLOOR MOUNTING

Motors should be provided with a firm, rigid foundation, with the plane of four mounting pads flat within .010" for 56 to 210 frame; .015" from 250 through 500 frame. This may be accomplished by shims under the motor feet. For special isolation mounting, contact Marathon Electric for assistance.

V-BELT DRIVE

1. Select proper type and number of belts and sheaves. Excessive belt load will damage bearings. Sheaves should be in accordance to NEMA Spec. MG-1 or as approved by the manufacturer for a specific application.
2. Align sheaves carefully to avoid axial thrust on motor bearing. The drive sheave on the motor should be positioned toward the motor so it is as close as possible to the bearing.

3. When adjusting belt tension, make sure the motor is secured by all mounting bolts before tightening belts.
4. Adjust belt tension to belt manufacturers recommendations. Excessive tension will decrease bearing life.
5. For more information see Marathon Electric Publication SB588.

DIRECT CONNECTED DRIVE

Flexible or solid shaft couplings must be properly aligned for satisfactory operation. On flexible couplings, the clearance between the ends of the shafts should be in accordance with the coupling manufacturer's recommendations or NEMA standards for end play and limited travel in coupling.

MISALIGNMENT and RUN-OUT between direct connected shafts will cause increased bearing loads and vibration even when the connection is made by means of a flexible coupling. Excessive misalignment will decrease bearing life. Proper alignment, per the specifications of the coupling being used, is critical.

Some large motors are furnished with roller bearings. Roller bearings should **not** be used for direct drive.

ELECTRICAL CONNECTIONS

CAUTION

Install and ground per local and national codes. Consult qualified personnel with questions or if repairs are required.

WARNING

1. Disconnect power before working on motor or driven equipment.
2. Motors with automatic thermal protectors will automatically restart when the protector temperature drops sufficiently. Do not use motors with automatic thermal protectors in applications where automatic restart will be hazardous to personnel or equipment.
3. Motors with manual thermal protectors may start unexpectedly after protector trips. If manual protector trips, disconnect motor from power line. After protector cools (five minutes or more) it can be reset and power may be applied to motor.
4. Discharge all capacitors before servicing motor.
5. Always keep hands and clothing away from moving parts.
6. Never attempt to measure the temperature rise of a motor by touch. Temperature rise must be measured by thermometer, resistance, imbedded detector, or thermocouple.
7. Electrical repairs should be performed by trained and qualified personnel only.
8. Failure to follow instructions and safe electrical procedures could result in serious injury or death.
9. If safety guards are required, be sure the guards are in use.

1. All wiring, fusing, and grounding must comply with National Electrical Codes and local codes.
2. To determine proper wiring, rotation and voltage connections, refer to the information and diagram on the nameplate, separate connection plate or decal. If the plate or decal has been removed, contact Marathon Electric for assistance.
3. Use the proper size of line current protection and motor controls as required by the National Electrical Code and local codes. Recommended use is 125% of full load amps as shown on the nameplate for motors with 40°C ambient and a service factor over 1.0. Recommended use is 115% of full load amps as shown on the nameplate for all other motors. Do not use protection with larger capacities than recommended. Three phase motors must have all three phases protected.

THERMAL PROTECTOR INFORMATION

The nameplate will indicate one of the following:

1. Motor is thermally protected
2. Motor is not thermally protected
3. Motor is provided with overheat protective device

For examples, refer to paragraphs below:

1. Motors equipped with built-in thermal protection have "THERMALLY PROTECTED" stamped on the nameplate. Thermal protectors open the motor circuit electrically when the motor overheats or is overloaded.
   The protector cannot be reset until the motor cools. If the protector is automatic, it will reset itself. If the protector is manual, press the red button to reset.
2. Motors without thermal protection have nothing stamped on nameplate about thermal protection.
3. Motors that are provided with overheat protective device that does not open the motor circuit directly will indicate "WITH OVERHEAT PROTECTIVE DEVICE".
   A. Motors with this type of "Overheat Protective Device" have protector leads brought out in the motor conduit box marked "P1" and "P2". These leads are intended for connection in series with the stop button of the 3-wire pilot circuit for the magnetic starter which controls the motor. See Figure 1.
   B. The circuit controlled by the above "Overheat Protective Device" must be limited to a maximum of 600 volts and 360 volt-amps.

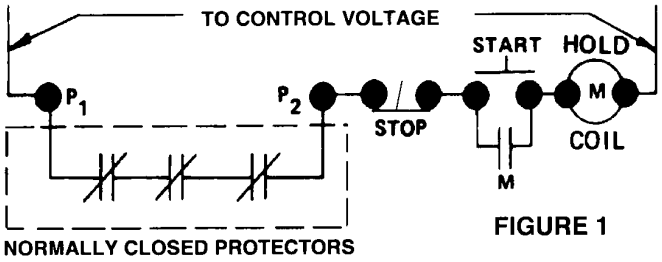
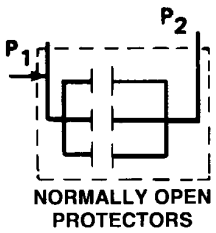


FIGURE 1



Normally Open (N/O) Motor Thermostats may be used in conjunction with controls installed by Original Equipment Manufacturers.

FIGURE 1A

CHANGING ROTATION

1. Keep hands and clothing away from rotating parts.
2. Before the motor is coupled to the load, determine proper rotation.
3. Check rotation by jogging or bumping. Apply power to the motor leads for a short period of time, enough to just get motor shaft to rotate a slight amount to observe shaft rotating direction.
4. Three phase - interchange any two (2) of the three (3) line leads. Single phase - reconnect per the connection diagram on the motor.

REDUCED VOLTAGE STARTING

Motors used on reduced voltage starting, should be carefully selected based upon power supply limitations and driven load requirements. The motors starting torque will be reduced when using reduced voltage starting. The elapsed time on the start step should be kept as short as possible and should not exceed 5 seconds. It is recommended that this time be limited to 2 seconds. Refer to Marathon Electric for application assistance.

OPERATION

WARNING

Disconnect and lock out before working on motor or driven equipment.

BEFORE INITIAL STARTING

1. If a motor has become damp in shipment or in storage, measure the insulation resistance of the stator winding.

$$\text{Minimum Insulation Resistance In Megohms} = 1 + \frac{\text{Rated Voltage}}{1000}$$

Do not attempt to run the motor if the insulation resistance is below this value.

2. If insulation resistance is low, dry out the moisture in one of the following ways:
   a. Bake in oven at temperature not more than 90°C (194°F).
   b. Enclose motor with canvas or similar covering, leaving a hole at the top for moisture to escape, and insert heating units or lamps.
   c. Pass a current at low voltage (rotor locked) through the stator winding. Increase the current gradually until the winding temperature, measured with a thermometer, reaches 90°C (194°F). Do not exceed this temperature.
3. See that voltage and frequency stamped on motor and control nameplates correspond with that of the power line.
4. Check all connections to the motor and control with the wiring diagram.
5. Be sure rotor turns freely when disconnected from the load. Any foreign matter in the air gap should be removed.
6. Leave the motor disconnected from the load for the initial start (see following caution). Check for proper rotation. Check for correct voltage (within ± 10% of nameplate value) and that it is balanced within 1% at the motor terminals. After the machine is coupled to the load, check that the nameplate amps are not exceeded. Recheck the voltage level and balance under load per the above guidelines.

   Shut down the motor if the above parameters are not met or if any other noise or vibration disturbances are present. Consult NEMA guidelines or the equipment manufacturer if any questions exist before operating equipment.

CAUTION

For motors nameplated as "belted duty only", do not run motor without belts properly installed.

COLLECTOR RINGS (Wound Rotor Motors Only)

The collector rings are sometimes treated at the factory to protect them while in stock and during shipment. The brushes have been fastened in a raised position. Before putting the motor into service, the collector rings should be cleaned to remove this treatment. Use a cleaning fluid that is made for degreasing electrical equipment. All of the brushes must be released and lowered to the collector surface. Keep the rings clean and maintain their polished surfaces. Ordinarily, the rings will require only occasional wiping with a piece of canvas or non-linting cloth. Do not let dust or dirt accumulate between the collector rings.

BRUSHES (Wound Rotor Motors Only)

See that the brushes move freely in the holders and at the same time make firm, even contact with the collector rings. The pressure should be between 2 and 3 pounds per square inch of brush surface.

When installing new brushes, fit them carefully to the collector rings. Be sure that the copper pigtail conductors are securely fastened to, and make good contact with, the brushholders.

ALLOWABLE VOLTAGE AND FREQUENCY RANGE

If voltage and frequency are within the following range, motors will operate, but with somewhat different characteristics than obtained with correct nameplate values.

1. Voltage: Within 10% above or below the value stamped on the nameplate. On three phase systems the voltage should be balanced within 1%. A small voltage unbalance will cause a significant current unbalance.
2. Frequency: Within 5% above or below the value stamped on the nameplate.
3. Voltage and Frequency together: Within 10% (providing frequency above is less than 5%) above or below values stamped on the nameplate.

CLEANLINESS

Keep both the interior and exterior of the motor free from dirt, water, oil and grease. Motors operating in dirty places should be periodically disassembled and thoroughly cleaned.

CONDENSATION DRAIN PLUGS

All explosion proof and some totally enclosed motors are equipped with automatic drain plugs, they should be free of oil, grease, paint, grit and dirt so they don't clog up. The drain system is designed for normal floor (feet down) mounting. For other mounting positions, modification of the drain system may be required, consult Marathon Electric.

SERVICE

WARNING

Disconnect power before working on motor or driven equipment. Motors with automatic thermal protectors will automatically restart when the protector cools. Do not use motors with automatic thermal protectors in applications where automatic restart will be hazardous to personnel or equipment.

CAUTION

Overgreasing bearings can cause premature bearing and/or motor failure. The amount of grease added should be carefully controlled.

NOTE

If lubrication instructions are shown on the motor nameplate, they will supersede this general instruction.

Marathon Electric motors are pregreased with a polyurea mineral oil NGLI grade 2 type grease unless stated otherwise on the motor nameplate. Some compatible brands of polyurea mineral base type grease are: Chevron SRI #2, Rykon Premium #2, Exxon Polyrex EM or Texaco Polystar RB.

Motors are properly lubricated at the time of manufacture. It is not necessary to lubricate at the time of installation unless the motor has been in storage for a period of 12 months or longer (refer to lubrication procedure that follows).

LUBRICATION PROCEDURES

1. Stop motor. Disconnect and lock out of service.
2. Remove contaminants from grease inlet area.
3. Remove filler and drain plugs.
4. Check filler and drain holes for blockage and clean as necessary.
5. Add proper type and amount of grease. See the Relubrication Time Intervals table for service schedule and Relubrication Amounts table for volume of grease required.
6. Wipe off excess grease and replace filler and drain plugs (see following warning).
7. Motor is ready for operation.

WARNING

If motor is nameplated for hazardous locations, do not run motor without all of the grease or drain plugs installed.

RELUBRICATION TIME INTERVAL

(For motors with regreasing provisions).

Service Condition	NEMA FRAME SIZE					
	140-180		210-360		400-510	
	1800 RPM and less	Over 1800 RPM	1800 RPM and less	Over 1800 RPM	1800 RPM and less	Over 1800 RPM
Standard	3 yrs.	6 months	2 yrs.	6 months	1 yr.	3 months
Severe	1 yr.	3 months	1 yr.	3 months	6 months	1 month
Seasonal	See Note 2.					

NOTE

1. For motors nameplated as "belted duty only" divide the above intervals by 3.
2. Lubricate at the beginning of the season. Then follow service schedule above.

SEASONAL SERVICE: The motor remains idle for a period of 6 months or more.

STANDARD SERVICE: Up to 16 hours of operation per day, indoors, 100°F maximum ambient.

SEVERE SERVICE: Greater than 16 hours of operation per day. Continuous operation under high ambient temperatures (100° to 150°F) and/or any of the following: dirty, moist locations, high vibration (above NEMA standards), heavy shock loading, or where shaft extension end is hot.

RELUBRICATION AMOUNTS

(For motors with regreasing provisions).

NEMA FRAME SIZE	VOLUME cu. in. (fluid oz.)
140	.25 (.14)
180	.50 (.28)
210	.75 (.42)
250	1.00 (.55)
280	1.25 (.69)
320	1.50 (.83)
360	1.75 (.97)
400	2.25 (1.2)
440	2.75 (1.5)
500	3.00 (1.7)

TROUBLESHOOTING

WARNING

1. Disconnect power before working on motor or driven equipment.
2. Motors with automatic thermal protectors will automatically restart when the protector temperature drops sufficiently. Do not use motors with automatic thermal protectors in applications where automatic restart will be hazardous to personnel or equipment.
3. Motors with manual thermal protectors may start unexpectedly after protector trips. If manual protector trips, disconnect motor from power line. After protector cools (five minutes or more) it can be reset and power may be applied to motor.
4. Discharge all capacitors before servicing motor.
5. Always keep hands and clothing away from moving parts.
6. Never attempt to measure the temperature rise of a motor by touch. Temperature rise must be measured by thermometer, resistance, imbedded detector, or thermocouple.
7. Electrical repairs should be performed by trained and qualified personnel only.
8. Failure to follow instructions and safe electrical procedures could result in serious injury or death.
9. If safety guards are required, be sure the guards are in use.

If trouble is experienced in the operation of the motor, make sure that:

1. The bearings are in good condition and operating properly.
2. There is no mechanical obstruction to prevent rotation in the motor or in the driven load.
3. The air gap is uniform. (Consult manufacturer for specifications).
4. All bolts and nuts are tightened securely.
5. Proper connection to drive machine or load has been made.

In checking for electrical troubles, be sure that:

1. The line voltage and frequency correspond to the voltage and frequency stamped on the nameplate of the motor.
2. The voltage is actually available at motor terminals.
3. The fuses and other protective devices are in proper condition.
4. All connections and contacts are properly made in the circuits between the control apparatus and motor.

These instructions do not cover all details or variations in equipment nor provide for every possible condition to be met in connection with installation, operation or maintenance. Should additional information be desired for the purchaser's purposes, the matter should be referred to the nearest Marathon Electric Manufacturing Corp. sales office listed on the back page.

MOTOR TROUBLE SHOOTING CHART

Your motor service and any trouble shooting must be handled by qualified persons who have proper tools and equipment.

TROUBLE	CAUSE	WHAT TO DO
Motor fails to start	Blown fuses	Replace fuses with proper type and rating
	Overload trips	Check and reset overload in starter.
	Improper power supply	Check to see that power supplied agrees with motor nameplate and load factor.
	Improper line connections	Check connections with diagram supplied with motor.
	Open circuit in winding or control switch	Indicated by humming sound when switch is closed. Check for loose wiring connections. Also see that all control contacts are closing.
	Mechanical failure	Check to see if motor and drive turn freely. Check bearings and lubrication.
	Short circuited stator	Indicated by blown fuses. Motor must be rewound.
	Poor stator coil connection	Remove end bells, locate with test lamp.
	Rotor defective	Look for broken bars or end rings.
	Motor may be overloaded	Reduce load.
Motor stalls	One phase may be open	Check lines for open phase.
	Wrong application	Change type or size. Consult manufacturer.
	Overload	Reduce load.
	Low voltage	See that nameplate voltage is maintained. Check connection.
	Open circuit	Fuses blown, check overload relay, stator and pushbuttons.
Motor runs and then dies down	Power failure	Check for loose connections to line, to fuses and to control.
Motor does not come up to speed	Not applied properly	Consult supplier for proper type.
	Voltage too low at motor terminals because of line drop.	Use higher voltage on transformer terminals or reduce load. Check connections. Check conductors for proper size.
	Starting load too high	Check load motor is supposed to carry at start.
	Broken rotor bars or loose rotor	Look for cracks near the rings. A new rotor may be required as repairs are usually temporary.
	Open primary circuit	Locate fault with testing device and repair.
Motor takes too long to accelerate and/or draws high amp	Excessive load	Reduce load.
	Low voltage during start	Check for high resistance. Adequate wire size.
	Defective squirrel cage rotor	Replace with new rotor.
	Applied voltage too low	Get power company to increase power tap.
Wrong rotation	Wrong sequence of phases	Reverse connections at motor or at switchboard.
Motor overheats while running under load	Overload	Reduce load.
	Frame or bracket vents may be clogged with dirt and prevent proper ventialation of motor.	Open vent holes and check for a continuous stream of air from the motor.
	Motor may have one phase open	Check to make sure that all leads are well connected.
	Grounded coil	Locate and repair.
	Unbalanced terminal voltage	Check for faulty leads, connections and transformers.
Motor vibrates	Motor misaligned	Realign.
	Weak support	Strengthen base
	Coupling out of balance	Balance coupling.
	Driven equipment unbalanced	Rebalance driven equipment.
	Defective bearings	Replace bearing.
	Bearings not in line	Line up properly.
	Balancing weights shifted	Rebalance motor.
	Polyphase motor running single phase	Check for open circuit.
	Excessive end play	Adjust bearing or add shim.
Unbalanced line current on polyphase motors during normal operation	Unequal terminal volts	Check leads and connections.
	Single phase operation	Check for open contacts.
	Unbalanced voltage	Correct unbalanced power supply.
Scraping noise	Fan rubbing air shield	Remove interference.
	Fan striking insulation	Clear fan.
	Loose on bedplate	Tighten holding bolts.
Noisy operation	Airgap not uniform	Check and correct bracket fits or bearing.
	Rotor unbalance	Rebalance.
Hot bearings general	Bent or sprung shaft	Straighten or replace shaft.
	Excessive belt pull	Decrease belt tension.
	Pulleys too far away	Move pulley closer to motor bearing.
	Pulley diameter too small.	Use larger pulleys.
	Misalignment	Correct by realignment of drive.
Hot bearings ball	Insufficient grease	Maintain proper quantity of grease in bearing.
	Deterioration of grease or lubircant contaminated	Remove old grease, wash bearings thoroughly in kerosene and replace with new grease.
	Excess lubricant	Reduce quantity of grease, bearing should not be more than 1/2 filled.
	Overloaded bearing	Check alignment, side and end thrust.
	Broken ball or rough races	Replace bearing, first clean housing thoroughly.

JOHNSON CONTROLS

Johnson Controls, Inc.
Systems Products Division
507 East Michigan Street
P.O. Box 423
Milwaukee, WI 53201

Series A19 Temperature Controls—Single-Pole, Single-Throw and Single-Pole, Double-Throw Models with NEMA 1 Enclosure

Application

These controls are designed to cover a broad range of general purpose operating temperature control applications in the refrigeration, air conditioning and heating field with a minimum number of models. Typical applications are: frozen food cases, display cases, beverage coolers, milk coolers, etc. Various control ranges are available.

Controls are supplied with an adjustable range (except models with factory sealed settings) and adjustable or nonadjustable differential.

All Series A19 temperature controls are designed for use only as operating controls. Where an operating control failure would result in personal injury and/or loss of property, it is the responsibility of the installer to add devices (safety, limit controls) or systems (alarm, supervisory systems) that protect against, or warn of, control failure.

Installation

Follow equipment manufacturer's instructions if provided. If instructions are not provided proceed as follows:

Mounting

Controls are normally mounted to a surface through holes in back of case.

CAUTION: On rough mounting surfaces use the top two mounting holes only. When these controls are mounted on an uneven surface using screws in all four holes, the case can be twisted enough to affect the control's calibration and operation.

For closed tank applications without well assembly Part No. FTG13A-600R packing nut assembly may be supplied. See Fig. 3 for sequence of installation. Put parts over support tube section of element, placing bulb into tank. Tighten 1/2" NPT adapter. Screw packing nut into adapter with the retaining washers and packing in place as shown.

To install models supplied with bulb well, first install bulb well into tank. Remove bushing from bulb well and slide bushing over capillary. Replace bushing into bulb well. Push bulb into position in bottom of well. Tighten set screw in end of adapter to hold bulb in position. See Fig. 4 for bulb well illustration.

CAUTION: Do not dent or deform the sensitive bulb of this control. A dent or deformation will change the calibration and cause the control to cycle at a temperature lower than the dial setting. When the bulb mounting clip is used to mount the bulb near the refrigerant tubing, be sure the sheet metal screw does not pierce the tubing.

Adjustments

The A19 temperature controls may be supplied with an external range adjustment and screwdriver slot as shown in Fig. 1, range adjustment knob or solid cover as shown in Fig. 7. Solid cover models with calibrated dial are adjusted by removing the cover and moving dial so the desired setting is in line with the dial pointer on the stop bracket. (See Fig. 8.) Convertible adjustment models can be field converted from concealed screwdriver slot adjustment to knob adjustment or external screwdriver slot adjustment. They are supplied with a snap-in plug in the cover to provide

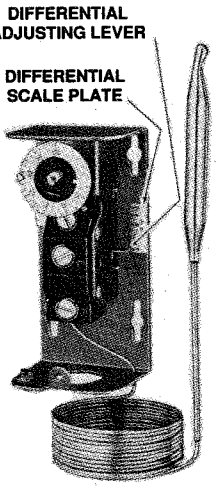


Fig. 1 — An A19 with external range adjustment and screwdriver slot.

concealed screwdriver slot adjustment. For knob adjustment remove the snap-in plug and press the knob onto the slotted shaft. For external screwdriver slot adjustment remove the snap-in plug. The convertible adjustment models with remote bulb include a bulb mounting clip.

Dial settings normally indicate the cutout setting unless otherwise specified by the equipment manufacturer. Models with SPDT

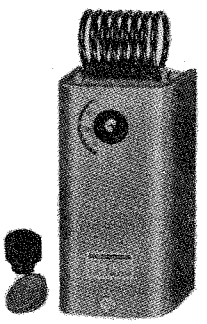


Fig. 2 — The Space Thermostats with convertible adjustment have a snap-in plug in the cover, built-in screwdriver slot and a knob for field installation.

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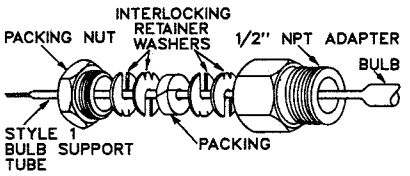
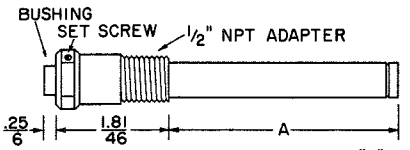


Fig. 3 — Part No. FTG13A-600R packing nut assembly. (Used with swaged bulb with support tube for direct immersion application.)



BULB WELL NUMBER	DIMENSION "A"
WELI4A-600R(MONEL)	4.75(121)
WELI4A-602R	4.94(125)
WELI4A-603R	5.81(148)
WELI6A-601R	2.81(71)

Fig. 4 — Bulb well for liquid immersion applications where a temperature bulb may be removed without draining tank.

contacts are normally set so the red (common) to yellow contacts open at the dial setting.

Models with adjustable differential and ranges of 20/80° F (–5/28° C), –30/50° F (–35/10° C) and –30/100° F (–35/40° C) have a differential scale plate showing differential in degrees. Other ranges have a scale plate (see Fig. 1) with a multiplier shown. For example when "MIN" differential is 5F° (2.8C°) then x2 is 10F° (5.6C°), x3 is 15F° (8.3C°), etc. The controls are supplied with adjusting lever at minimum differential stamped on the control. To adjust move the lever to the differential required.

Low cutout or high cutout stop supplied on certain models (specified by the equipment manufacturer).

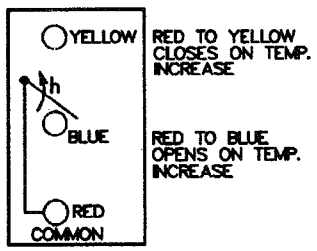


Fig. 5 — Terminal arrangement of SPDT models.

WIRE RED TO YELLOW FOR COOLING

If high or low cutout stop adjustment is required proceed as follows:

1. Set dial to temperature at which stop is desired.
2. Remove cover of the control.
3. Loosen the cutout stop screw, slide the screw to the front of the temperature control against the plastic step behind the dial and tighten the screw. (See Fig. 8.) Sometimes an exact stop setting is not possible and stop must be set to the closest step corresponding to dial setting required.
4. Replace cover.

Wiring

CAUTION: Disconnect power supply before wiring connections are made to avoid possible electrical shock or damage to equipment.

All wiring should conform to the National Electrical Code and local codes. Single-pole, double-throw models should be wired as shown in terminal drawing. Use copper conductor only. (See Fig. 5.)

CAUTION: Use terminal screws furnished (8–32 x 1/4" binder head). Substitution of other screws may cause problems in making proper connections.

Checkout Procedure

Before applying power, make sure installation and wiring connections are according to job specifications. After the necessary mechanical adjustment and electrical connections have been made, an operational checkout is recommended.

Adjust the control set point to put the system in operation and observe at least three complete operating cycles to be sure that all components are functioning correctly.

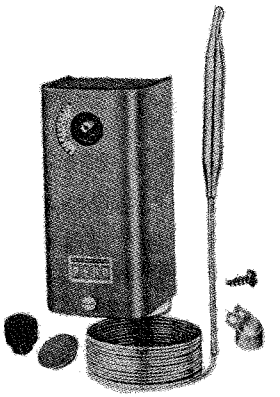


Fig. 6 — The A19 with remote bulb and convertible adjustment has a snap-in plug in the cover, a knob for field installation and a bulb mounting clip.

If the system fails to operate, recheck the wiring and components.

Repairs and Replacement

Field repairs must not be made. For a replacement control contact the nearest Johnson Controls wholesaler.

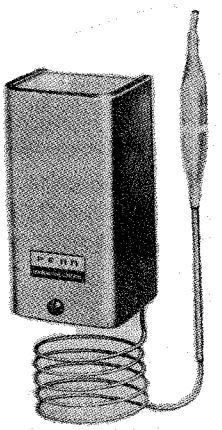


Fig. 7 — An A19 with solid cover and concealed adjustment.

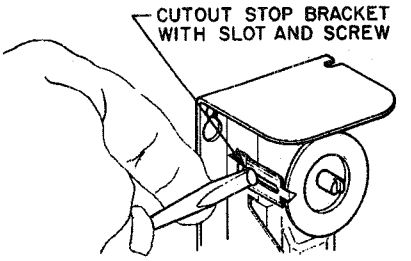


Fig. 8 — All models have a screw type cutout stop. The stop screw must be loosened and moved to the stop setting desired. Tighten screw after setting is made.

12 Trouble-Shooting

If the Air Conditioner should require service, we have compiled a trouble-shooting chart to assist your service personnel. If additional assistance is required please contact Pfannenberg Inc.

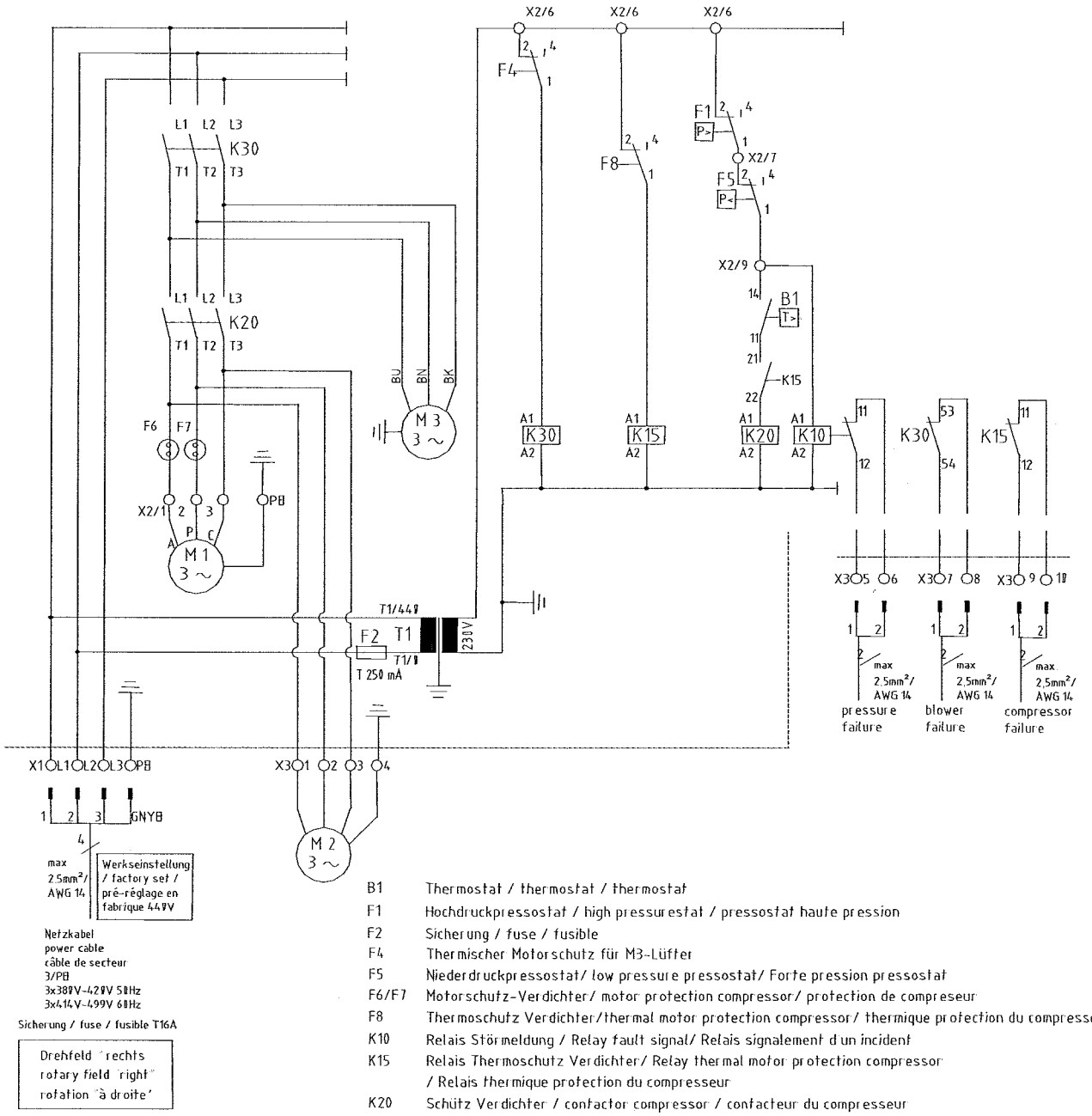
Problem	Possible Cause(s)	Solution
Unit not cooling	No Power	Check Power Source and Electrical Connections
	Loss of Refrigerant	Locate and repair leak
	Evaporator or Condenser Fan not operating	Replace motor, Capacitor or entire Assembly
	Filter clogged	Clean or replace Filter
	Dirty Evaporator or Condenser	Clean Device
	Thermostat improperly set	Lower setting until unit starts
	Thermostat defective	Replace Thermostat or Relay
	Failed Compressor	Replaced Compressor
Ice on Evaporator Coil	Insufficient Heat Load or Unit Oversized for Application	Contact Pfannenberg Inc.
	Failed Evaporator Fan	Replace Evaporator Fan Motor or Assembly
	Dirty Evaporator	Clean Device
Condensate draining continuously	Enclosure not properly sealed	Check and seal all openings
	Excessive opening of Enclosure	Eliminate the frequency of door opening
	Thermostat improperly set	Setting on 35°C / 95°F
Condensate fails to drain off	Malfunction on condensate overflow	Clean overflow and/or check that hose is connected without kinks
Excessive vibration	Defective Fan	Replace Fan
	Compressor Loose	Tighten Mounting Bolts
Compressor Inoperative	Low line Voltage	Check Nameplate Voltage
	Loss of Compressor Oil	Replace Compressor
	Loss of Refrigerant	Locate and repair leak
	Failed Compressor Capacitor	Replace Capacitor
	Thermal Overload	Contact Pfannenberg Inc.
	Power interruptions	Allow Compressor time to reset
Refrigerant or Oil leaks	Crack or pin hole in tubing or brazed joints	Replace tubing or rebraze joint

Technical Data - Series DTS 12000

Model	DTS 12000
Cooling data	
Rated capacity at ambient 35°C (95°F) / internal 35°C (95°F) *	3250 W
Refrigerant type *	R 134a
Refrigerant charge *	840 g / 29,6 oz
Adjustable safty thermostat setting 1 TAS (factory set)	+29.5°C/+85°F
Permissible min./max. ambient air temperature	+8°C (+46°F) to +52°C (+125°F)
Air volume unrestricted, external circulation	fan supplied externally
Air volume unrestricted, internal circulation	690 m³/h / 406 cfm
Condensate discharge	after evaporation direct via tube
Noise level (1m / 3.29 ft distance)	≤ 65dB(A)
Electrical data	
Rated voltage *	460 V
Mains frequency *	60 Hz
Operating range (IEC 60038)	3x380 –420 V 50 Hz/ 3x 414 – 499 V 60 Hz
Power consumption *	1833 VA
Nominal current *	3 A
Starting current *	13 A
Line cord	Terminals
EMI/RFI suppression	CE
Dimensions (incl. roof plate)	
Height	1680 mm / 66.14 inch
Width	482.6 mm / 19.00 inch
Depth	323.85 mm / 12.75 inch
Weight	64 kg / 140 lb
Unit orientation for installation and storage	vertical
Exterior case construction	galvanized sheet steel and stainless steel
Protection classification	NEMA 4/4X if properly mounted to enclosure

* ID Plate Information

Circuit Diagram



B1	Thermostat / thermostat / thermostat
F1	Hochdruckpressostat / high pressure stat / pressostat haute pression
F2	Sicherung / fuse / fusible
F4	Thermischer Motorschutz für M3-Lüfter
F5	Niederdruckpressostat/ low pressure pressostat/ Forte pression pressostat
F6/F7	Motorschutz-Verdichter/ motor protection compressor/ protection de compreseur
F8	Thermoschutz Verdichter/thermal motor protection compressor/ thermique protection du compresseur
K10	Relais Störmeldung / Relay fault signal/ Relais signalement d un incident
K15	Relais Thermoschutz Verdichter/ Relay thermal motor protection compressor / Relais thermique protection du compresseur
K20	Schütz Verdichter / contactor compressor / contacteur du compresseur
K30	Netzschütz/ power contactor / secteur contacteur
M1	Verdichter / compressor / compresseur
M2	Verflüssiger- Ventilator / condenser fan / ventilateur du condenseur
M3	Verdampfer- Ventilator / evaporator fan / ventilateur de l'évaporateur
T1	Steuertransformator / control transformer / transformateur de contrôle
X1-X3	Klemmleiste / terminal board / bornier de raccordement

Schaltschrank-Kühlgerät/cooling unit/climatiseur

Expo Technologies

Installation, Operation and Maintenance Manual for Expo Technologies
Leakage Compensation (LC) and
Continuous Flow with High Purge (Model CFHP)
Manifolded logic Pressurizing Systems for Class I
conforming to
NFPA 496 2003 edition

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IMPORTANT NOTE

It is essential, to ensure conformity with the standard, that the user of the Expo Technologies observe the following instructions:

Please refer to the standard for detailed requirements and definitions.

References to clauses in the standard are in italics

Contents:

Section 0 Description and principle of operation
Section 1 Installation of the system
Section 2 Operation of the system
Section 3 Maintenance of the system
Section 4 Fault Finding
Section 5 Annex (if applicable)

Section 0 Description and principle of operation

All Expo Technologies pressurization systems provide

a) a method of pressurizing a Pressurized Enclosure (PE) while at the same time compensating for any leakage, together with

b) a method of Purging the enclosure before power is turned on to remove any flammable gas that may have entered the enclosure while it was unpressurized.

All systems have the following two major items:

- A **Control Unit (CU)** containing as a minimum, for "Y" and "Z" Pressurization, a Flow Control Valve (FCV), Minimum Pressure and Purge Flow sensing devices, a "Pressurized"/"Alarm" indicator and an output signal showing whether the PE pressure is satisfactory or not.

Type "X" Pressurization Control Units, in addition, have a fully automatic Purging controller with a Purge timer and electrical power switch interlock.

- A **Relief Valve (RLV)** fitted to the Pressurized Enclosure (PE) to provide a means of limiting the maximum pressure experienced by the PE during operation. The RLV model number has a suffix giving the diameter of the valve aperture (in millimetres) e.g. RLV - - /cs (Carbon Steel) or /ss (Stainless Steel). All RLV's incorporate a metal foam Spark Arrestor to prevent sparks being ejected from the PE through the RLV aperture. The Relief Valve design is patented.

CFHP systems with a Continuous Flow of air after purging have a calibrated Outlet Orifice which can be either be within the Relief Valve (suffix ..cf) or a separate item type SA** or SAU**.

Model LC and CFHP Expo Technologies systems are covered by this manual They are described on the following paragraphs.

0.1 "Leakage Compensation" systems, Model LC

A Leakage Compensation system, Model LC, is intended to have minimal flow after the initial purge time. The Pressurised Enclosure (PE) is built as leak tight as possible and the LC system merely tops up for any enclosure leakage. The system provides an initial high flow of purging air which leaves the PE through the Relief Valve. After the initial purging has been completed the Control Unit changes over to Leakage Compensation mode and the Relief Valve closes. The only flow thereafter is the flow through the "Leakage Compensation Valve" (LCV) which is adjusted so that the flow is just enough to compensate for any leakage from the Pressurized Enclosure (PE). Hence the term "Leakage Compensation". In consequence the system is much more economical to operate than a "Continuous Flow" system.

The Purging Flow rate is monitored by a separate "Purge Flow Sensor" located in the Control Unit which detects the back pressure caused by the purge flow rate through the RLV Spark Arrestor. The Spark Arrestor is calibrated during manufacture so that the back pressure at the desired Purge Flow rate is known. The Purge Flow Sensor is set to operate when that back pressure is exceeded. The output from the Flow Sensor is indicated on the Control Unit and on "X" Pressurization systems, used to operate the automatic purge timer. Both Enclosure Pressure and Purge Flow have to be correct before the Purge Timer can start

0.2 "Continuous Flow after High Purge" Model CFHP system

The CFHP Control Unit is identical to the LC version. The difference is in the provision of one or more fixed outlet orifices to provide a deliberate "leak" at a known flow rate. The Outlet Orifice is pre-calibrated so that the

pressure drop at the desired flow rate is known. The Minimum Pressure Sensor within the Control Unit will be set to the same value as the pressure drop. When the PE pressure exceeds the calibrated pressure the Continuous Flow must be taking place

There are three ways of providing this calibrated Outlet Orifice in current production. Please consult the system specification sheet to determine which has been supplied. The choice:

- Type SAU** where the Outlet Orifice disk is removable and can be easily changed by the user to give different flow rates according to the size of the Pressurized Enclosure and the available air supply capacity. (** denotes the metric thread size of the SAU body)

- Type SA** where the orifice size is fixed and the way to change the flow rate is either to change the setting of the Minimum Pressure Sensor or to replace the SA with one of another size. (** denotes the nominal thread size of the SA body)

- For low flow rates, the Outlet Orifice may be incorporated within the Relief Valve making use of the existing metal foam Spark Arrestor. The Relief Valve will then have a suffix /CF**, where ** is the orifice size in millimetres.

The Leakage Compensation Valve in the CU is opened sufficiently to provide enough air both to compensate for any accidental leakage as well as provide the Continuous Flow through the outlet orifice. In this way a high flow rate is provided during the initial purge period which is thereafter reduced to the desired Continuous Flow rate. Even if the PE had no accidental leakage there would still be a flow from the outlet orifice.

A continuous flow of air can be necessary where the PE has equipment that needs cooling or where there is a possible source of flammable gas inside the PE which needs dilution.

The purge time is based on the initial Purge Flow rate.

If the same flow rate is needed (or is acceptable) both during and after purging a Model CF (Continuous Flow) system is more economical

Section 1 Installation of the system

1.1 Installation of the Expo LC and CFHP Systems

.1 The Expo system should be installed either directly on or close to the Pressurized Enclosure (PE). If not installed on the PE it should be as close as possible. It should be installed so that the system indicators may be readily observed

.2 All parts of any system carry a common serial number. If installing more than one system, ensure that this commonality is maintained on each installation.

.3 Any tubing, conduit and fittings used to connect to the PE should be metallic, or, if non-metallic, conform to the local codes for flammability ratings. No valve may be fitted in any tube connecting the Expo system to the PE.

.4 If the purge exhaust is required to be discharged into a non-classified area the ducting shall conform to:

4.2.2 *Discharge of the protective gas*

.5 The user or manufacturer of the PE shall determine the volume of the PE, the necessary purging volume, and the time to be allowed for purging using the Expo system purging flow rate chosen. It is the user's responsibility to verify or enter this data on the PE and/or Expo system name plate. Ask Expo if in doubt.

Example calculations:

a) If the PE external dimensions give a volume of 20 cubic feet, and the PE is NOT a motor, multiply the volume by four to get the Purging Volume i.e. 80 cubic feet. Divide the Purging Volume by the purge rate e.g. 32 cubic feet per minute, and round up to the next even minute above, i.e. 4 minutes.

b) If the PE is a motor, multiply the internal free volume by ten to get the Purging Volume. In this case the Purging time would be 8 minutes

.6 If the PE contains an internal source of release of flammable gas or vapour, the procedures for assessment of the release as given in Chapter 8 of NFPA 496 shall be observed. The user must verify that the specification of the Expo system e.g. pressures, continuous flow (dilution) rate and type of protective gas are correct for the specific application. If an inert protective gas is required the Expo Control Unit can be specified to have Compressed Air for the control logic and Inert Gas for the protective gas to minimise Inert Gas consumption.

.7 More than one PE can be protected by a single system. If PEs are connected and purged in "series" e.g. "Daisy Chained", the Outlet Orifice must be fitted on the last enclosure with the Purge Inlet to the first enclosure. The bore and length of the tube or conduit used to interconnect the enclosures is critical and will determine the maximum pressure experienced by the first enclosure in the series. Advice on sizing can be obtained from your Expo Technologies, sales office. The test pressure for all the enclosures should be 3 times the pressure inside the first enclosure when purging is taking place.

If PE's are to be connected in parallel each enclosure must have its own outlet Relief Valve, Purge Flow Sensor and Pressure Sensor. System "Models" can be mixed e.g. Model LC for one enclosure and Model CF for another. An example would be a Gas Chromatograph instrument. Expo systems with this facility have option code "TW".

1.2 Quality and installation of the Pressurizing air or inert gas supply

.1 The source of the compressed air must be in a non-classified area. Inert gas may be used as an alternative to compressed air.

2 Unless a supply shut-off valve has been specially fitted within the Expo system, a valve with the same, or larger, thread size as the Control Unit inlet fitting shall be fitted externally and, for "Y" and "Z" Pressurization systems, be provided with a suitable nameplate, see clause:

4-8.2 Enclosures that can be isolated from the gas supply

4-11.4 "Warning-Protective gas supply valve"

3 The tubing and fittings used must conform to 1.1.3 above.

4 The following clauses from NFPA 496:2003 shall be observed:

4.4.1 The quality and contamination of the protective gas

4.4.1.2 Type of protective gas

4.4.2 Piping for the protective gas

4.4.3 Air compressor intake in a non-classified location

4.4.4 Compressor intake line requirements

4.4.5 Compressor power supply requirements

1.3 Provision and installation of Alarm devices

1 Expo Technologies systems have a Minimum Pressure Sensor set to a pressure of at least 0.1" w.c (0 25mb). When the PE pressure is above this set point the Sensor produces a positive "Pressurized" signal. This is displayed on a Red/Green indicator fitted on the Control Unit and can also be used to operate an electrical contact for a remote "Alarm". The pneumatic signal may be supplied either

a) to an electrical pressure operated switch (Option Code /IS) suitable for an Intrinsically Safe circuit in accordance with Expo drawing EP80-2-11, (or for a Non-Incendive circuit in Division 2), or

b) to a bulkhead fitting where it is available to the user (Option Code /PO). It can then be used to operate an external electrical switch either local e.g. explosionproof), or remote in a non-classified area.

When the enclosure pressure falls below the set point of the Sensor the "Pressurized" signal is removed, i.e. the absence of the signal indicates a "Alarm" ("Pressure Failure") condition. The user must make use of this external alarm facility in accordance with NFPA496 2003 requirements if the system "Alarm" indicator is not located in a place where it can be readily observed

Example: The "Pressurized" signal can be used to produce an "Alarm" action by means of a conventional "pressure switch" set to operate at around 15psi (1 bar) The "Pressurized" signal from the Control Unit at 30psi (2 bar) or more will hold the switch in the operated position until the CU detects a low pressure in the Pressurized Enclosure and removes the "Pressurized" signal. The Alarm switch will reset and its contacts can be used to operate a remote electrical alarm.

If the switch is located in the hazardous area it must either be part of an Intrinsically Safe circuit, or be suitably protected e.g. explosionproof The pressure switch should be IS or explosionproof even if it is fitted within the Pressurized Enclosure

Expo Technologies tip: Exception: For a "Z Purge" system fitted in a Division 2 area a non-classified switch inside the PE can be used to operate a remote Alarm provided its electrical supply comes from within the PE (i.e. NOT PROVIDING DRY CONTACTS). When the PE is in use the Alarm can operate normally in response to the pneumatic signal from the CU with option /PO. When the PE power is switched off there is no need for an alarm! Ask for the circuit diagram.

The Alarm switch can also be located in a nearby non-classified location. To get the best response time the switch should be as close as possible to the CU and the maximum length of tubing between the CU and the Alarm switch should not exceed 150 feet (30m) unless "Quick Exhaust Valves" are used (please ask for help) See clauses:

4.10.1 Cut off the power automatically

See also *Exception:*

For "Y" and "Z" Pressurizing systems:

4.3.2 Protective gas supply failure alarm required

4.8.3 If an alarm is used

4.8.4 If an indicator is used

2 No valves may be fitted between the Expo system and the alarm switch.

1.4 Power supplies and their isolation

1 All power entering the PE shall be provided with a means of isolation. This requirement also applies to any external power sources which are connected to "dry contacts" or "volt-free contacts" within the PE.

Exception: Power to Intrinsically Safe, or other apparatus which is already suitable for the location need not be isolated by the Expo Technologies system.

Expo Technologies Tip: It is much better to fit dry or volt-free contacts in the non-classified area or inside an explosionproof box rather than inside the PE. Please ask Expo about "MiniPurge Interface Units" (MIU).

In the case of "X" Pressurization, the isolation of the power must be controlled by the Expo system using the "Purge Complete" pneumatic signal to operate a "Power Switch" in a similar manner to that described in 1.3.1 above.

In the case of "Y" or "Z" Pressurization the power may be controlled manually by the user by the use of local isolating switch.

2 The electrical installation shall conform to the local codes and the following clauses from NFPA496 2003

4.4.6 Power supplies for "double pressurized" installations

4.10.1 Power Cutoff Switch to de-energize all circuits not approved for Division 1 on failure of the protective gas supply.

Exception: The power may remain connected for a short period if immediate cutoff could result in a more hazardous condition and if audible and visual alarms are provided in a constantly attended location.

.3 Many Expo Mini-X-Purge and Super-Mini-X-Purge systems can be retrofitted in the field by the user to have an "Alarm Only" action on pressure or flow failure. It is then the responsibility of the user to de-energize the protected equipment as soon as possible.

.4 The Power (cutoff) Switch must be approved for the location or located in a non-classified area.

.5 No valves are permitted between the Power switch and the Expo system.

.6 For "X" Pressurization, the PE door shall have fasteners that can be opened only by the use of a tool or key. Otherwise the following clauses from NFPA 496 2003 apply:

5.5.2 Door switch interlock

5.5.2.1 Approved for Division 1

Note: The door switch provided with the Expo system (when requested) is pneumatic or electric.

1.5 Marking

.1 The Expo system carries a nameplate giving specification data such as serial and models numbers, Pressure Sensor settings, flow rates and purge time. The same data is also given in the specification sheet accompanying the system.

.2 Other marking required by the standard includes:

4.11.1 Pressurized Enclosure

*"**WARNING - PRESSURIZED ENCLOSURE***
This enclosure shall not be opened unless the area is known to be free of flammable materials or unless all devices within have been de-energized"

5.3.1 Start-up Markings
"Power shall not be restored after the enclosure has been opened until the enclosure has been purged for___minutes at a flow rate of___ "

Expo note: It is understood that Clause 4.11.1 requires the de-energization of all devices that are not suitable for the hazard e.g. devices that are not Explosionproof or Intrinsically Safe. An explosionproof anti-condensation heater for example would not have to be de-energized.

.3 If Inert Gas is used as the Protective Gas and a risk of asphyxiation exists, a suitable warning plate should be fitted to the PE.

Section 2 Operation of the system

2.1 Initial Commissioning

.1 Check that the system has been installed in accordance with Section 1 of this manual.

.2 Disconnect the supply pipe from the inlet to the Control Unit and blow air through for at least 5 seconds per foot of length (15sec/metre) to remove any debris, oil and condensation.

.3 Connect a temporary pressure gauge or liquid manometer to the PE or Control Unit "Pressure Test Point", [on the L.P. Sensor, by the removal of the Red plug - 5/32" (4mm) OD nylon tube].

2.2 Commissioning Leakage Compensation (LC) and Continuous Flow High Purge (CFHP) "X" Purge systems.

(see 2.6 for LC and CFHP "Y" and "Z" Purge systems) On LC and CFHP "X" Purge systems proceed as follows:

.1 Open the Leakage Compensation Valve (LCV) to about 50% of its travel.

.2 Open the supply shutoff valve SLOWLY and allow the PE pressure to rise until the Relief Valve (RLV) opens. Check that the RLV opens at or below the figure specified in the documentation. Repeat the test several times.

.3 Open the supply shutoff valve fully and the purging flow will start.

.4 Check that the internal logic gauge reads 30psi (2bar). If not, adjust the logic pressure regulator to suit (lift the red ring to unlock the knob first)

.5 At this time the "Pressurized" indicator should be Green and the "Purging" indicator should be Yellow. If the yellow indicator remains black the flow through the Relief Valve is below the minimum for which the Flow Sensor has been calibrated. Check the air supply pressure **at the inlet to the Control Unit while purging is taking place**. It must be above the minimum specified. The larger Super-Mini-X-Purge system has a built-in gauge on the filter for this purpose.

.6 On LC and CFHP "X" purge systems the purge timer will start as soon as the "Purging" indicator turns Yellow. Check that the time delay between the indicator turning yellow and the application of power to the PE is not less than the minimum time required to purge the PE. Times in excess of the minimum are permitted and a tolerance of +25% is normally acceptable. If the time is too short it must be adjusted accordingly. Two types of Purge Timer control are currently in production:

a) The original system has a single timer reservoir and a black rotary timer control where the OUTER BODY of the timer restrictor is turned counter-clockwise to increase the time setting. (DO NOT adjust the central screw!) The setting is quite sensitive (logarithmic) and only small adjustments (e.g. one scale division) should made between repeated timing checks unless the time is much too short. As a guide the following table can be used for Mini and Sub-Mini-X-Purge systems. (Multiply by 3 for Super-Mini)

Scale No:	2	3	4	5	6	7	8
Minutes:	0.8	1.5	2	3.5	6	12	20

b) The alternative system uses a pneumatic incremental timer which is adjusted by fully opening or closing one or more of five screwdriver-operated valves, arranged in a block on the control logic manifold – see GA Drawing The opening of each valve incrementally provides a fixed number of minutes of purging time as in the following table

Valve:	1	2	3	4	5
Minutes:	2	4	8	8	16

Thus for a 12 minute purge time, valves 2 and 3 would be open and the others closed. For twenty-four minutes, 4 and 5 would be open and the others closed. **At least one valve must always be open and the screws must be at the appropriate limit of travel.**

.7 After the power has been turned on by the Control Unit, the Purging Valve will close and the air flow into the enclosure will be controlled by the Leakage Compensation Valve (LCV). The initial setting of 50% open may be too high or too low. It should now be adjusted to set the PE pressure and leakage.

There are three possible situations:

a) Air continues to come out through the RLV Spark Arrestor after power has been turned on in considerable quantity The LCV is too far open and the air flow is holding the RLV open continuously. (Note: Some CFHP systems have a deliberate but modest "Continuous" air flow through the RLV in normal operation; do not confuse this flow rate with that caused by excessive setting of the LCV.) Close the LCV slowly observing the manometer or gauge (see item 2.3 above). The PE pressure will start to fall as the flow decreases but eventually the RLV will close and the pressure rise again. At this point the Relief Valve may start to open intermittently as the PE pressure rises to the point where the RLV recloses and the enclosure pressure starts to rise again. This is entirely normal for this type of RLV. Proceed now to b) below:

b) If the Relief Valve is opening intermittently the LCV is slightly too far open. Observe the manometer or gauge When the RLV opens the enclosure pressure falls quickly to the point where the RLV recloses and the enclosure pressure starts to rise again. This is entirely normal for this type of RLV and shows that it is working correctly.

Then continue to close the LCV until the cycling stops and the enclosure pressure starts to fall. Carefully adjust the LCV until the PE pressure is approximately 50% of the RLV opening pressure and stable. This pressure may be around 2"wc (5mb) and will be the "normal working pressure".

We recommend that the setting of the Minimum Pressure Sensor is checked at this time. Note the position of the LCV knob. (A pencil mark placed on the knob at "12 o'clock" can be used). Slowly lower the PE pressure by closing the LCV further counting the number of turns from the "normal working pressure" position. Note the pressure at which the "Pressurized" indicator turns Red and check that it is not lower than the figure given in the documentation. Check also the "Alarm" electrical contacts (if fitted).

As soon as the "Pressurized" indicator turns Red, the enclosure power will be switched off (see also .8 below) and the system will start to repurge

While it is re-purging return the LCV to its "Normal Working pressure" position so that, at the end of purging the enclosure pressure should immediately settle down at the correct "normal" pressure. Finally re-adjust the LCV if necessary.

c) If, at the end of purging, the PE pressure falls below the Minimum Pressure Sensor setting the LCV is not open far enough. The system will start to purge again. While it is purging open the LCV fully and check the enclosure for leakage. This time, at the end of purging, the enclosure should stay pressurized and the Relief Valve action be as in a) or b) above. It is likely that there is significant leakage from the enclosure and attempts to reduce the leakage will be time well spent.

CFHP systems are intended to have a Continuous Flow through the enclosure. The Continuous Flow may emerge through the RLV, in which case the RLV will have a "CF" in its model number Other CFHP systems will have a separate Outlet Orifice/Spark Arrestor and air can be felt emerging through this aperture whenever the enclosure is pressurized

.8 Some "X" Purge LC and CFHP systems can have the "Action on Pressure Failure" (normally "Alarm and Trip") adjusted by the user to become "Alarm Only" in accordance with NFPA496 Clause 4.10.1, exception; please contact your Expo Technologies, Sales office for further details.

2.3 Commissioning Leakage Compensation (LC) and Continuous Flow/High Purge (CFHP) "Y" and "Z" systems.

On LC and CFHP "Y" and "Z" Purge systems, proceed as follows:

.1 Open the supply shutoff valve.

.2 Adjust the Leakage Compensation Valve (LCV) so that the enclosure pressure rises to the point where the "Pressurized" indicator turns green.

.3 Continue to raise the PE pressure until the Relief Valve (RLV) opens. Check that the RLV opens at or below the figure specified in the documentation. Repeat the test several times.

.4 Lower the PE pressure until the "Pressuized" indicator turns Red. Check that the indicator turns Red at or above the pressure specified in the documentation. Check the external alarm contacts (if fitted).

.5 Open the LCV again and set the PE pressure to a level around 50% of the RLV operating pressures. This "working" pressure is not critical. The "Pressurized" indicator should be Green.

.6 Turn the Purge Control Valve "On". This will start the High Purge Flow and the "Purging" indicator should turn

Yellow If the "Purging" indicator remains Black the flow through the outlet valve is below the minimum for which the Flow Sensor has been calibrated. Check the air supply pressure at the inlet to the Control Unit while purging is taking place. It must be above the minimum specified. (Super-Mini-Purge systems have a built-in gauge on the filter for this purpose) If the supply pressure is correct and the "Purging" indicator does not turn Yellow, there is too much leakage from the Pressurized Enclosure. Find and fix the leaks!

"Purging" does not start until the indicator turns Yellow

7 On LC and CFHP "Z" Purge systems the purge timing function is performed by the user. When the "Purging" indicator turns Yellow the Purge Flow is above the minimum required and the purge time can start The user must ensure that the time delay between the indicator turning Yellow and the application of power to the PE is not less than the minimum time required to purge the PE as shown on the PE or Expo system nameplate.

Never turn on the power without purging first unless you have proved that the interior of the PE is gas free and checked that the "Pressurized" indicator is green!

8 After the purge time is completed the Purging Valve should be turned "Off". The High Purge Flow will cease and the air flow into the enclosure will then be controlled once again by the Leakage Compensation Valve (LCV), it should now be re-adjusted if necessary. The RLV should be closed and the enclosure pressure around 50% of the RLV opening pressure. If this is not so there are three possible situations:

a) Air continues to come out through the Spark Arrestor, after High Purge has been turned "Off", in considerable quantity. The LCV is too far open and the air flow is holding the RLV open continuously. (Note: Some CFHP systems have a deliberate but modest "Continuous" air flow through the RLV in normal operation; do not confuse this flow rate with that caused by the excessive opening of the LCV.) Close the LCV slowly observing the manometer or gauge (see item 2.3 above). The PE pressure will start to fall as the flow decreases but eventually the RLV will close and the pressure rise again. At this point the Relief Valve will start to open intermittently as the PE pressure rises to the point where it exceeds the RLV opening pressure when the RLV opens the pressure will fall quickly to the point where the RLV recloses and the enclosure pressure starts to rise again. This is entirely normal for this type of RLV. Proceed now to b) below:

b) If the Relief Valve is opening intermittently the LCV is slightly too far open. Observe the manometer or gauge When the RLV opens the enclosure pressure falls quickly to the point where the RLV recloses and the enclosure pressure starts to rise again This is entirely normal for this type of RLV and shows that it is working correctly.

Continue to close the LCV until the cycling stops and the enclosure pressure starts to fall Carefully adjust the LCV until the PE pressure is approximately 50% of the RLV opening pressure and stable. This pressure may be around 2"wc (5mb) and will be the "normal working pressure"

c) If, at the end of purging, the PE pressure falls below the Minimum Pressure Sensor setting the LCV is not open far enough. The LCV should be opened until the PE pressure is around the normal working pressure

9 CFHP systems are intended to have a Continuous Flow through the enclosure The Continuous Flow may emerge through the RLV, in which case the RLV will have a "CF" in its model number. Other CFHP systems will have a separate Outlet Orifice/Spark Arrestor and air can be felt emerging through this aperture whenever the enclosure is pressurized.

10 "Y" and "Z" purge systems do not control the enclosure power and it is the responsibility of the user to switch off the power whenever the enclosure pressure falls below the minimum permitted i.e. when the "Pressurized" indicator turns Red.

2.4 Normal operation

1 "X" Purge systems: Turn the air supply valve On or Off to start or stop the system, After this the Pressurizing and Purging sequence is entirely automatic.

2 "Y" and "Z" Purge systems are started and stopped in the same way as "X" purge system but the user must close the Power Switch only after the enclosure has been pressurized and purged sufficiently to ensure that the interior of the enclosure is gas free. The power should be shut off as soon as possible after pressure failure. This is also the user's responsibility.

Section 3 Maintenance of the system

The maintenance recommended for the system consists of the following items, supplemented by any additional local requirements imposed by the authority having jurisdiction.

3.1 Commissioning

The tests to be performed during commissioning are described in Section 2 of this manual. They include checking the opening pressure of the Relief Valve, the setting of the Minimum Pressure Sensor, the "Normal Working Pressure" of the enclosure and, for "X" purge systems, the setting of the purge timer.

3.2 Routine maintenance

1 Expo recommend that the commissioning tests be performed again within six months. In addition the following checks are also recommended at that time:-

- Check the RLV and any other Spark Arrestors. Remove any debris or corrosion, or replace with a spare

- Check the condition of the air supply filter element. Clean or replace it as necessary

2 At least every two years, check the following additional items:-

- The apparatus suitable for the Hazardous location
- There are no unauthorised modifications
- The source of air is uncontaminated
- The interlocks and alarms function correctly
- Approval labels are legible and undamaged
- Adequate spares are carried
- The action on pressure failure is correct

Section 4 Fault Finding – LC and CFHP systems

4.1 General If the system does not behave in the manner described above there is a fault. Some of the more likely faults are dealt with below. If a cure cannot be effected by following the procedure shown below please call Expo (24 hour answering) or your supplier for further assistance.

The system has been designed for ease of fault finding and many of the components fitted are plug-in or sub-base mounted. Check components by substitution only after establishing that such action is necessary. If the system is less than 12 months old, parts under warranty should be returned to Expo Technologies for investigation, with a full report of the fault and the system Serial number.

NOTE: As with any pneumatic system the greatest enemies are water, oil and debris in the air supply. For this reason a dust and water filter should always be fitted. But debris can enter from other sources and it is vital therefore that the procedures described in Section 2 is carried out before using the system for the first time, or following any disconnection of the pipework. Failure to perform this work may cause damage which will not be covered under warranty.

Fault Finding

NOTE: Before making the following checks verify that the main supply pressure is between 60 and 115 psi (4-8bar) at the Control Unit and, for X-Purge systems, the regulated pressure on the logic gauge is 30 psi (2 bar)

4.2 Minimum Pressure alarm is on continuously ("Pressurized" indicator is Red)

Possible cause 1: The Pressurized Enclosure (PE) pressure is too low. Try increasing the setting of the Flow Control Valve (FCV) to raise the pressure in the PE.

Possible cause 2: Enclosure fault?

- Is the ACTUAL PE pressure below the setting of the Minimum Pressure Sensor? Check it with a manometer or gauge.
- Is there debris stuck on the face of the Relief Valve disk, perhaps held there because of the magnetic material?
- Has the PE door been closed and all conduit/cable glands sealed?
- Is the PE leaking too much?
- Has the pressure sensing tube been damaged?

Possible cause 3: System fault?

If checks in (a) above reveal that the PE is correct, the fault probably lies in the Control Unit. The basic operation of the Minimum Pressure Sensor can be checked by unscrewing the 2.4" (60mm) diameter diaphragm and, by using a finger, block the threaded hole in the top of the valve module. The valve should operate and the indicator turn Green. If this works correctly and the enclosure pressure is above the setting of the Minimum Pressure Sensor it is likely that the Pressure Sensor diaphragm needs recalibrating or replacing. (See below)

4.3 Relief Valve open (continuously or intermittently)

Possible cause 1: The PE pressure is too high.

The Leakage Compensation Valve (LCV) is too far open. Adjust the LCV as described in Section 2 above.

Possible cause 2: Debris on the RLV disk allowing air to leak from the valve. Remove the RLV cover and clean the valve disk. The disk and spring may be removed from the RLV without affecting the calibration.

4.4 "Purging" indicator will not turn Yellow during purging

Possible cause 1: Insufficient purging Flow due to inadequate air supply pressure. Check the air supply pressure at the inlet to the CU when flow is taking place. Excessive pressure drop in the supply pipe is a very common cause of this problem. The supply pipe must be at least as big as the CU inlet fitting, i.e. at least ½" NB (12mm).
Super-MiniPurge systems with ¾" or 1" connections must have AT LEAST this internal diameter for supply and outlet tubing. Due to the high flows demanded from these large systems the need for adequate supply tubing is VITAL. If in doubt, or for long distances, install tubing that is at least 50% larger than the inlet size!

Possible cause 2: Excessive Pressurized Enclosure (PE) leakage. Check around the PE when flow is taking place. Any significant leakage must be cured. Has a Leakage Test been done? The total leakage should not exceed 10% of the Purge Flow Sensor setting. Check for leakage down the conduit through unsealed stopping boxes.

Possible cause 3: PE not strong enough. Repeat the PE pressure test. FM recommend that the PE is tested to three times the Relief Valve opening pressure e.g. 12"wc (30mb) for many systems. Has this been done?

Possible cause 4: The tubing from the RLV Flow Sensing point to the Purge Flow Sensor is not air-tight

e.g. fitting nuts not tightened or tube damaged. Check and repair as necessary.

Possible cause 5: The Purge Flow Sensor is not operating correctly or out of calibration. The basic operation of the Purge Flow Sensor can be checked by unscrewing the 2.4" (60mm) diameter diaphragm and by using a finger, block the threaded hole in the top of the valve module The valve should operate and the indicator turn Yellow. If this works correctly and the flow through the Relief Valve is above the minimum required WITH THE RELIEF VALVE COVER FIRMLY SECURED IN PLACE the Sensor diaphragm needs recalibrating or replacing.

4.5 System fails to switch power on after the purge time has elapsed? ("X"-Purge systems only)

Possible cause 1: Is power available? Is the power disconnect closed? Are the fuses or circuit breaker OK?

Possible cause 2: System fault? Timer not timed out?

a) Has the "Purging" indicator been Yellow for the whole of the purge time?

b) Is the logic pressure gauge at 30psi (2bar) ±10%.

c) Check the small indicator on the timer valve. When the timer has timed out it should return out when depressed.

d) Is there pressure at the Power Switch output bulkhead and at the Power Switch itself? Is the Switch set at 15psi (1bar)?

e) Is the pipe to the Power Switch airtight? The signal to the Power Switch bulkhead has a restrictor which limits the permissible leakage from the pipe.

f) Note the timer setting. Reset the timer to the minimum available purging period (see Para. 2.2.6) and check operation on that purge time. If it works OK, increase the time progressively until either it is correct, or the system ceases to time out at all. In the latter case, there is an air leak in the timer circuit. (A leak in the timing circuit can cause the timer not to time out) If possible establish the source of the leak with soapy water and retest the system This will involve removing the chassis from the Control Unit – be sure this is the cause before starting the work. It is VERY unusual!!

Ensure that the timer is returned to its original setting and the purge time checked before putting the system back into service.

Possible cause 3: Faulty Power Switch. Check the operation of the Power Switch It should close above 20psi (1.4 bar).

4.6 Pressure Sensor calibration. If it is decided that the Minimum Pressure Sensor or Purge Flow Sensor needs recalibrating it can either be returned to Expo for this service or it can be done by the user as follows:

Disconnect the pressure sensing pipe from the top of the diaphragm. (It is a "push-in" quick release fitting; firmly push inwards the collar surrounding the pipe where it enters the fitting, and then pull the pipe outwards while maintaining the pressure on the collar). Unscrew the 2.4" (60mm) diameter diaphragm housing from the top of the Sensor. Invert it and note the brass adjusting screw in the centre Turning the screw inwards (clockwise) will lower the setting. It is likely that the screw will be very stiff due to the locking sealant. If the screw cannot be moved the application of gentle heat in the area of the brass screw can often help. DO NOT OVERHEAT!

4.7 Filter cleaning If the filter element needs cleaning the transparent bowl can be unscrewed and removed. The filter element also unscrews and can then be cleaned in soapy water. Do not use solvents on any part of the filter assembly.

Expo Technologies tip: It is sometime easier, if the bowl is very tight, to remove the filter by undoing the fitting that holds the filter into the Control Unit On Sub-Mini-X-Purge systems it may be necessary to remove the Minimum Pressure Sensor diaphragm first.

Section 5 Annex of Options fitted

Refer to the annex of this manual for any options fitted as designated by the model code of the system

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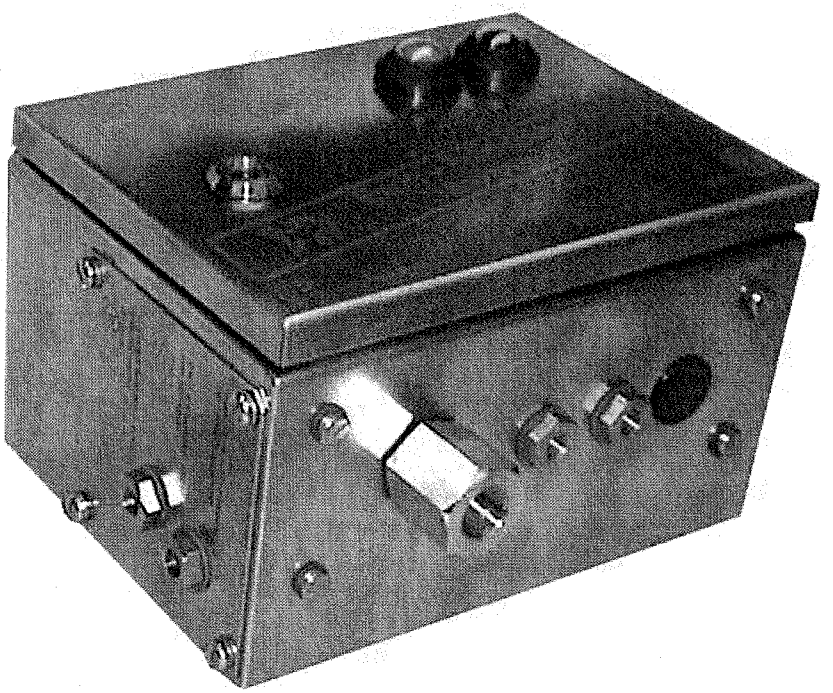
MiniPurge Size 1 Manual
ML 306



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Commissioning
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Specification sheet

SPECIFICATION SHEET - Sub Minipurge Systems

Model No. (Example): **00 1XLC / SS / PO / WM** (Note: Not all codes are valid)

Purge System Type
00 = Minipurge

Size
1 = Sub Minipurge

Approval/ Certification
X = Europe EN50016 1995
Sira 01 ATEX1295X

USA / Canada NFPA 496
cUL, E190061. FM, 1X8A4AE
Class I Div 1 Grp A, B, C & D

Australia AS 2380 pt 4
SA WorkCover Ex 3199U
Class I Zone 1 & 2 IIC
Option available on request

Purging Method
CF = Continuous Flow
LC = Leakage Compensation

MiniPurge Housing
SS = 316L Stainless Steel (NROB finish) Neoprene "Top" Mount Gasket
PM = Panel Mount (Side/Front Mount) 316L Stainless Steel (NROB finish)

Options as required
AO = Alarm Only (CF Option only)
MO = Manual Override
MK = MIU MOUNTING KIT (PO systems only)
WM = Wall Mounting Bars

Power & Alarm (Signals)
PO = Pneumatic output
'Power' : On Purge complete = 30 psi / 0.2MPa / 2 bar Signal
'Alarm' : Loss of Pressure = No signal
"Pressurized" = 30 psi / 0.2MPa / 2 bar Signal

PA = Power and Alarm Terminal Box EEx e IIC T6
"Power" : 250 Vac 4 Amp AC14 2PNO - EEx d IIC T6
"Alarm" : 250 Vac 4 Amp AC14 SPCO - EEx d IICT6
(European Systems Only)

IS = Intrinsically Safe, Exi & EEx i circuit
'Power' : used with others' Ex i equipment
'Alarm' : Relay / Barrier

Note: Not all combinations are possible.

Supply Pressure:	Must be regulated at inlet Minimum 60 psi / 0.4MPa / 4 bar Maximum 115 psi / 0.8MPa / 8 bar.		
Air quality:	Compressed air / Nitrogen to instrument quality.		
Ambient Temperature:	-20° to +55°		
Leakage Compensation:	Variable up to 2 scfm / 60 Nl/min to compensate for Leakage of Enclosure		
Purge Timer:	Stepped Adjustable between 1 minute and 30 minutes		
Flow & Pressure Sensors:	**CF:**	One sensor for both "Low Pressure and Flow":	1" WC / 250 Pa (2.5 mbar)
	LC:	"Low Pressure Sensor":	0.2" WC / 50 Pa (0.5 mbar)
		"Flow Sensor":	1.38" WC / 350 Pa (3.5 mbar)

Relief Valve:	System:	**CF**	**LC**
	Model No:	RLV25/ss	RLV25/FS/ss
	Opening Pressure:	4" WC / 1 kPa (10 mbar)	4" WC / 1 kPa (10 mbar)
	Purge Flow Rate:	N / A (see Spark Arrestor)	8 scfm / 225 Nl/min

Material : 316L Stainless Steel, Spark Arrestor - Nickel-Chrome, Neoprene Gasket

Spark Arrestor Unit (CF systems Only):	Model No:	SAU25
	Purge / Dilution Flow Rate:	Between 0.4 & 8 scfm / 10 & 225 Nl/min. 8 user selectable orifice plates
	Model No:	Stainless Steel

Action on "Loss of Pressure"
CF = Action on "Loss of Pressure" = "Alarm & Trip". /AO on the Model # specifies an "Alarm Only" kit.
LC = Action on "Loss of Pressure" = "Alarm & Trip" or "Alarm Only". LC Model is User adjustable.:

Bulkhead Pipe Fittings:	Air Supply:	1/2" NPT
	Output:	1/2" NPT
	Signal:	1/8" NPT
Visual Indicators:	**CF:**	Alarm/Pressurized (Red/Green) Purge Complete (Red/Green)
	LC:	Alarm/Pressurized (Red/Green) Purge in Progress (Black/Amber)

Figure 1 Specification sheet (DRG Ref:- XBR-7TD0-001)

MiniPurge Size 1

Customer System Specification, Test & Inspection sheet

Customer: Date:
Contact: Quote:
Customer's Ref: Our Job:
Customer's P.O: Dated:
Purge serial number: **M3** Relief Valve serial number: **R3**

Pressurized Enclosure

Approval : SIRA Supplied by:
Classification :
Size HxWxD (mm) : Volume (Litres):
Contents :
Internal Flammable Gas Source : No Door(s): tool or key operated: Yes
Enclosure Pressures: Normal (mb): 4 Max working (mb): 10 Test (mb): 18

Purge Control Unit Data

Model Number : _____

Purge Flow Sensors : Purging Flow OK set at _____ mbarg

Purge Flow rate: : Factory set _____ Nl/min.

: Customer set _____ Nl/min.

Purge Time : Factory set _____ (–0,+20%) Min : sec

: Customer set _____ (–0,+20%) Min : sec

Relief Valve Data

Type/Size : RLV25/.....
Opens at (mb) : 10
Materials : Stainless Steel. Gasket: Neoprene
Mounting method : Direct panel mounting to Expo drawing

Additional Calibrated Outlet Orifice/Spark Arrestor (Continuous Flow systems)

Type/Size : SAU25 (if applicable)
Material : Stainless steel
Thread : Metric M25, (1" clear)
Purge/Dilution Continuous Flow Rate (L/min):

Documentation

Instruction manual ML 306 :
Contents- Installation, maintenance & operating instructions, drawings, certificates.

Test & Inspection Report.

Tested by		Date:	
Inspected by		Date:	

Organisation of this manual

The manual covers the **Size 1 MiniPurge** from the Expo range of MiniPurge systems. The manual starts with the products specification and options. It then describes the various options available and the attributes of each option. Each section of the manual then describes the aspects that are common to all systems and then deals with specific matters relating to the different options.
If a pressurized enclosure and/or MiniPurge Interface Unit (MIU) are supplied under the same order as this MiniPurge system, drawings, specification sheets and certification for these products will be found as individual manuals.

Application Suitability

Purge systems may be used for hazards of certain gas groups, refer to Specification Sheet. Apparatus associated with the Purge system, such as intrinsically safe signalling circuits and flameproof enclosures containing switching devices will be limited in their gas group. The certification documentation supplied with any such devices must be checked to ensure their suitability.

This system is designed for use primarily with compressed air. Where other inert compressed gasses are used (Nitrogen, for example) the user must take suitable precautions so that the build up of the gas does not present a hazard to health. Consult the Control of Substances Hazardous to Health (COSHH) data sheet for the gas used. Where a risk of asphyxiation exists, a warning label must be fitted to the pressurized enclosure.

The following materials are used in the construction of MiniPurge systems. If substances that will adversely affect any of these materials are present in the surrounding environment, please consult Expo for further guidance.

Materials of construction:

Stainless Steel	Nylon
Mild (carbon) Steel	Polyurethane
Brass	Acrylic
Aluminium	Silicone Rubber

This equipment is designed for use under normal industrial conditions of ambient temperature, humidity and vibration. Please consult Expo before installing this equipment in conditions that may cause stresses beyond normal industrial conditions.

The Purge system shall be installed in accordance with relevant standards, such as EN 60 079-14, and any local codes of practice that are in force.

Description and principle of operation
MiniPurge systems are classified according to the four major attributes as shown in this example:

The size or capacity of the system
00 **1**XLC/SS/PO (example part No see Specification Sheet)
1 = Sub MiniPurge

The certification of the system
00 1**X**LC/SS/PO (example part No see Specification Sheet)
X = Europe EN 50016 1995 SIRA Ex 99E1002U Zone 1 & 2 IIC Sira 01ATEX1295X
(Also component Certificate Sira 01ATEX1104U & SCS Cert No.
Ex 94C1052U & Ex99E1002U)

0518 CE II 2 (2) G Ex

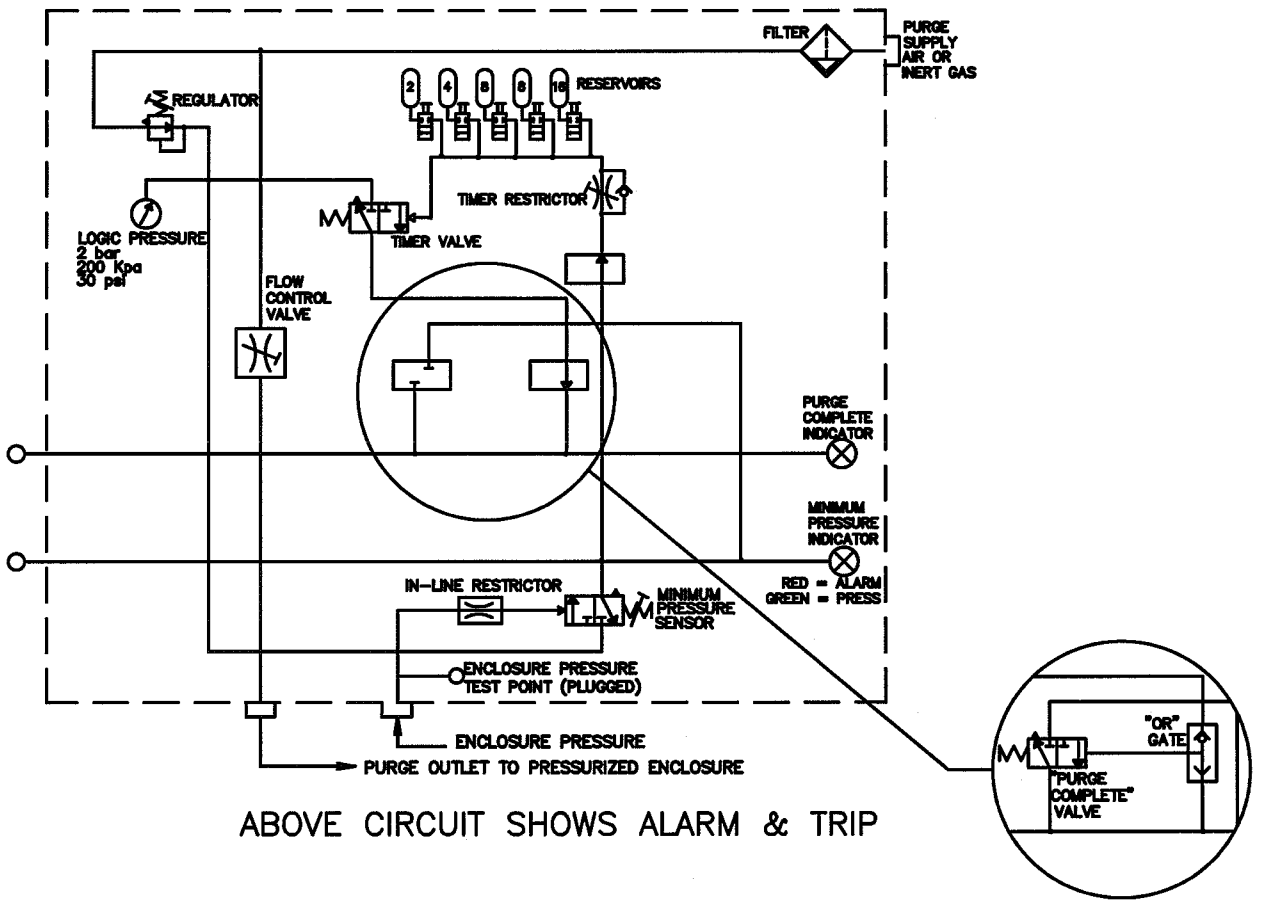
USA / Canada NFPA 496 cULus, E190061. FM, 1X8A4AE Class I Div 1 Group A, B, C & D
Upon request: Australia AS 2380 pt 4 SA Work Cover Ex 3199U Class I Zone 1 & 2 IIC

The method of pressurization
00 1X**LC**/SS/PO (example part No see Specification Sheet)
CF = Continuous Flow
LC = Leakage Compensation

The type of output and indication of the system
00 1XLC/SS/**PO** (example part No see Specification Sheet)
PO = Pneumatic output 'Power': On Purge complete = 30 psi / 0.2MPa / 2 bar Signal 'Alarm': Loss of Pressure = No signal "Pressurized" = 30 psi / 0.2MPa / 2 bar Signal
PA = Power and Alarm Terminal 'J' Box EEx e IIC T6
"Power": 250 Vac 4 Amp AC14 DPNO – EEx d IIC T6
"Alarm" : 250 Vac 4 Amp AC14 SPCO – EEx d IICT6
(European systems only)
IS = Intrinsically Safe, Exi & EEx i circuit 'Power' and 'Alarm': used with others Ex i relay / barrier for power and alarm interface.

Explanation of options & main components
Common Elements
All MiniPurge pressurization systems provide:
A method of pressurizing a Pressurized Enclosure (PE) while at the same time compensating for any leakage.
A method of purging the enclosure before power is applied to remove any flammable gas that may have entered the enclosure while it was unpressurized.
Visual indication of MiniPurge system status.
An output to provide remote indication or control.

The Methods of pressurizing
CF-Continuous Flow



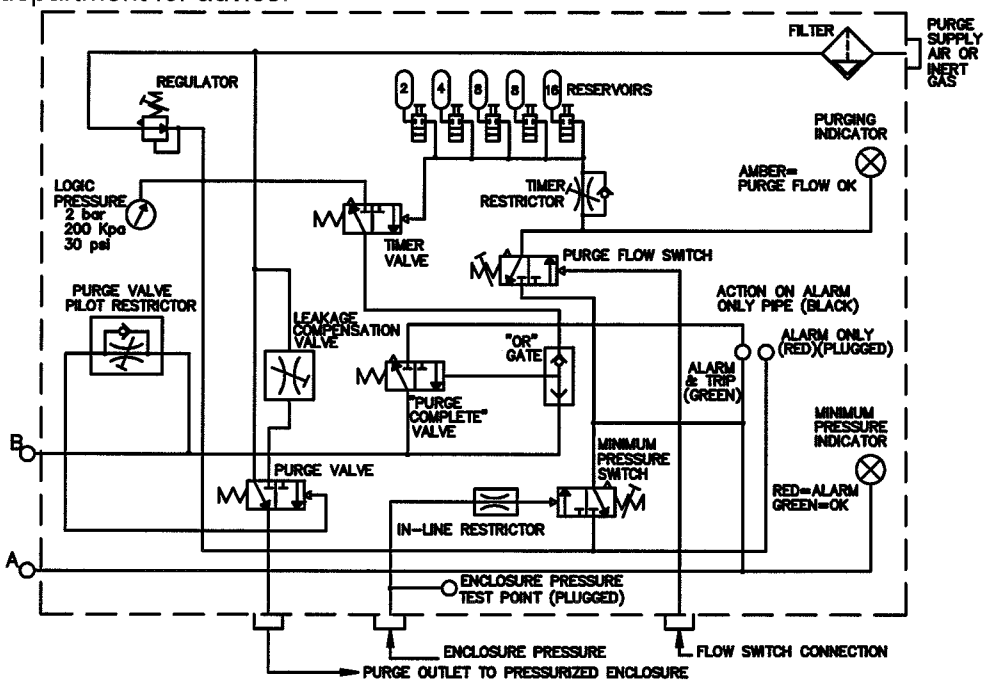
A continuous flow of protective gas is passed through the pressurized enclosure. Initially this flow is verified and performs the purging phase of the operation. When the purging phase is completed – i.e. the purge time has elapsed- the same flow of protective gas maintains the pressurization of the enclosure. This flow may be required to provide cooling of equipment in the pressurized enclosure, or to dilute an internal source of release.

Figure 2 Continuous flow circuit (Drg ref:- XBR-7TD0-006)

LC- Leakage compensation

Initially a high flow of protective gas is passed through the enclosure. This flow is verified and performs the purging phase of the operation. When the purging phase is completed – i.e. the purge time has elapsed - the flow of protective gas is provided via an adjustable valve so that it just compensates for any leakage from the pressurized enclosure in addition to maintaining its pressurization.

If leakage is less than 5 l/min then the leakage compensation valve will be awkward to set. You will find that the Relief Valve spring will cycle open and closed. If this happens contact our service department for advice.



REF DRG: MLA–ZDSP–000

Figure 3 Leakage compensation circuit

Type of output
The functions of the outputs are power control and alarm/pressurized indication. Power control provides a signal to switch the power to the pressurized enclosure. Alarm output provides a passive signal to indicate remotely when the enclosure is not pressurized and an active signal when pressurized.

PO- Pneumatic output
The power control and pressurized outputs are pneumatic signals, which may be used to operate other devices to provide power switching or alarm indication. The lack of any output signal indicates incomplete purge and alarm. In many instances these outputs may be connected to the Expo range of MiniPurge Interface Unit s (MIU).

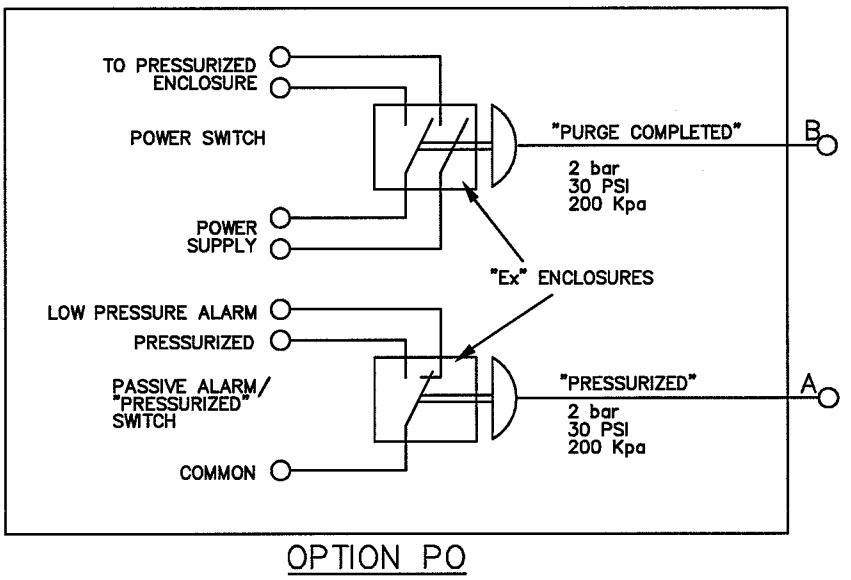


Figure 4 Pneumatic output option (Drg ref:- XBR-7TD0-006)

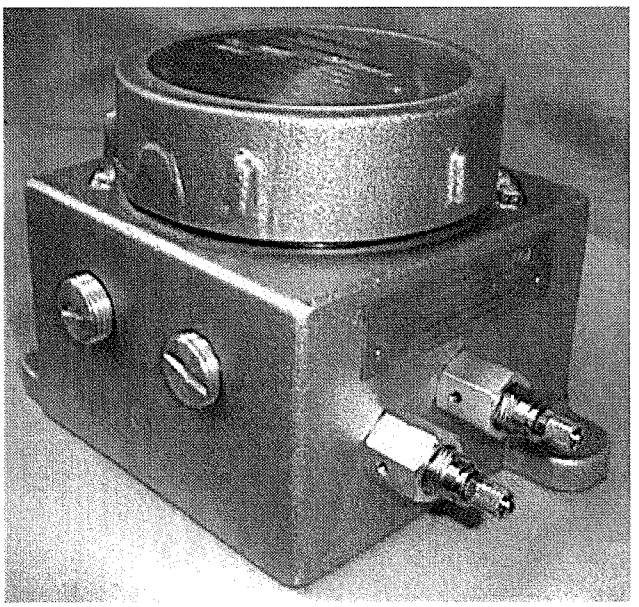


Figure 5 Typical MiniPurge interface unit type (MIU)

IS - Intrinsically safe output

The power control and alarm outputs are volt free contacts which form part of an intrinsically safe circuit which then provides power control or alarm outputs in a safe (unclassified) area. These contacts must only be connected to intrinsically safe circuits as the switch contacts are in the hazardous area. In many instances these outputs may be connected to the Expo range of MiniPurge Interface Units (MIU).

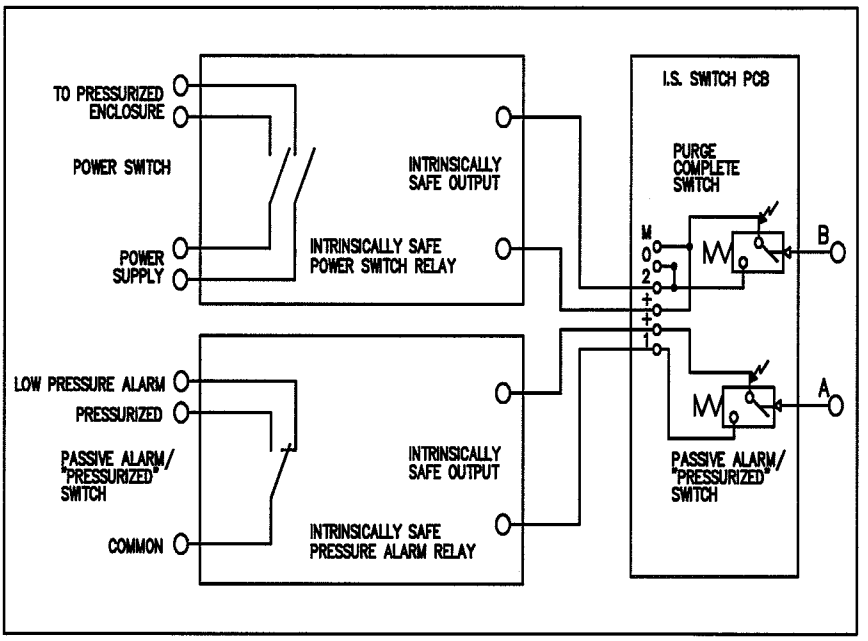


Figure 6 Intrinsically safe option (Drg ref:- XBR-7TD0-006)

PA - Power and Alarm

By integral EEx d flameproof switches, terminated in EEx e junction box in accordance with European standards.

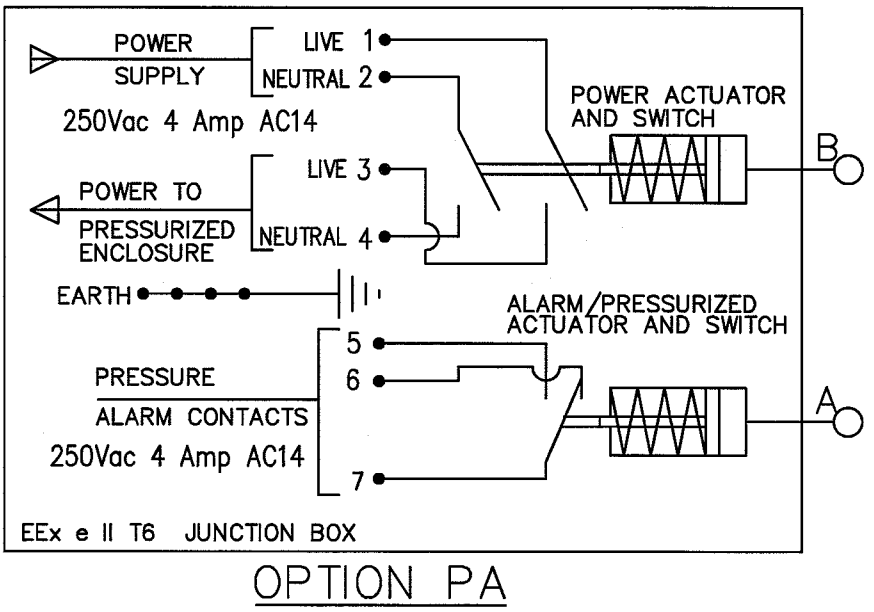


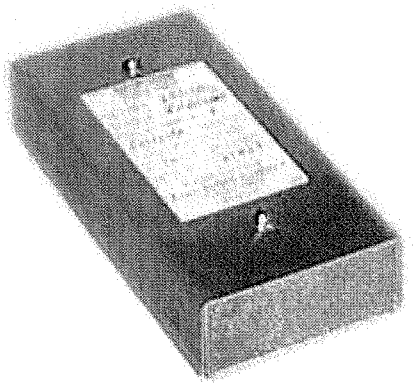
Figure 7 EEx de power and alarm option (Drg ref:- XBR-7TD0-006)

Certification
Expo MiniPurge systems are certified to **ATEX** European standards, **FM** and **cULus** approved to ANSI NFPA 496, North American standard, and also to **SA,** Australian standards. Details of the applicable certification are included in the certification section of this manual.

Equipment components
The Expo MiniPurge system comprises of a number of component units. The units required depend on the type of system selected. These are summarised in Table 1. The general description and function of each is as follows:

Control Unit (CU)
The control unit is at the heart of the system. It contains a pneumatic logic circuit specially designed and built to control the functions required for purge and pressurization. For all systems this includes air filtration, pressure and purge flow measurement, purge timing, and local visual indication of pressurized/Alarm and flow sensed. It also provides the outputs for power and remote alarm control corresponding to the output type selected.

Relief Valve (RLV)



The relief valve unit is fitted to the Pressurized Enclosure to provide a means of limiting the maximum pressure experienced by the Pressurized Enclosure during operation. The RLV model number has a suffix giving the diameter of the valve aperture in millimetres e.g. RLV25 (= 25mm bore). It also incorporates a Spark Arrestor to prevent sparks being ejected from the Pressurized Enclosure PE into the classified area. The Relief Valve design is patented.

Figure 8 Relief valve

Calibrated Outlet Orifice/Spark Arrestor (SAU)
To measure the flow through a pressurized enclosure, the differential pressure across a restriction or orifice is measured. In leakage compensation systems the flow measurement is incorporated in the relief valve. The continuous flow systems use the SAU25, which has a range of interchangeable calibrated orifice plates for the purge flow measurement.

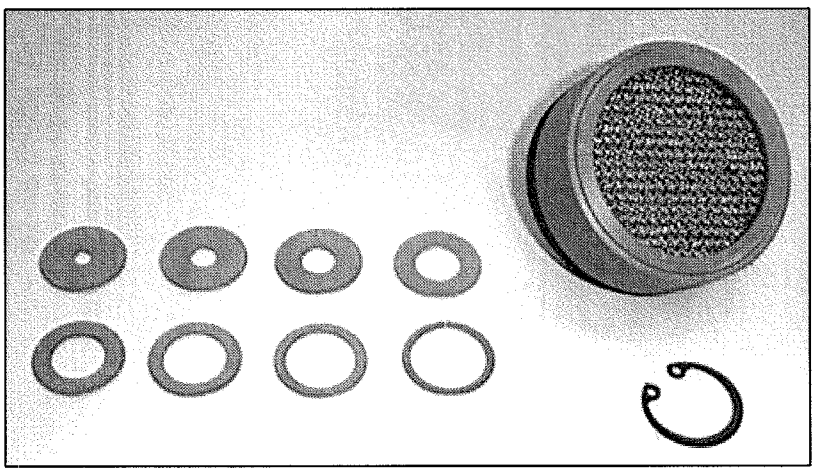


Figure 9 Spark arrestor type SAU25

Installation of the system

There are up to three components for the MiniPurge system, dependant upon the system type.

Table 1 System Components

System type	Control Unit (CU)	Relief Valve (RLV)	Spark Arrestor Unit SAU25
00 **1***/LC/SS/PO Leakage Compensation	YES	YES	Integral to RLV
00 **1***/CF/SS/PO Continuous Flow	YES	YES	YES

* see specification sheet for certification code.

Internal Gas Release

If the pressurized enclosure contains an internal source of release of flammable gas or vapour, the procedures for assessment of the release as given in NFPA 496, IEC79-2 or EN 50016 1996 should be used. Expo is pleased to provide assistance or consultancy and advice on such matters.

The user must verify that the specification of the Expo system e.g. pressure, continuous flow (dilution) rate and type of protective gas are correct for the specific application.

Multiple Enclosures

More than one pressurized enclosure can be protected by a single system. Where pressurized enclosures are connected and purged in "series" e.g. "Daisy Chained", the Relief Valve and when using a continuous flow system, the SAU25 should be fitted on the last enclosure with the Purge Inlet connected to the first enclosure. The bore and length of the pipe or conduit used to interconnect the enclosures is critical and will determine the maximum pressure experienced by the first enclosure in the series. Advice on sizing can be obtained from the Expo sales office but in general terms when using RLV25 or SAU25, the pipe bore size should not be less than 25mm (1"). A common fault of installing small bore pipe leads to over pressurizing of all but the last enclosure. If pressurized enclosures are to be connected in parallel each enclosure must have its own outlet either SAU25 or relief valve and pressure sensor.

Location

The MiniPurge system should be installed either directly on or close to the pressurized enclosure (PE). See mounting details.

Control Unit (CU)

Generally the most convenient arrangement is to install the control unit on the top of the pressurized enclosure. Must be mounted vertically as shown in MiniPurge Configuration XBR-7TD0-003. The control unit can be mounted on the side of the pressurized enclosure using the rear mounting fixings. The piped connections to the pressurized enclosure should be made using metallic tube through suitable bulkhead connections. The control unit can be remote mounted using the wall mounting bars (/WM option), and should be installed as close as possible to the pressurized enclosure. It should be installed so that the system indicators and certification labels may be readily observed.

Relief Valve (RLV) and Spark Arrestor Unit (SAU)
To achieve efficient purging the points where air enters and exits the pressurized enclosure should normally be at opposite ends of the pressurized enclosure. These items must be mounted vertically. The relief valve (RLV) or spark arrestor unit (SAU) is recommended to be situated at the bottom, or on the side of the enclosure at the bottom, when the control unit is top mounted on the enclosure, thus achieving top to bottom purging. The purge air may be piped within the pressurized enclosure to ensure purging of potential dead air spots. The proof of this may only be apparent when a CSA or European purge test is performed.

Connections to protective Gas supply.
The system should be connected to a protective gas supply, which is suitable for purging and pressurization. Generally instrument quality compressed air is used, though other inert gas may be used- e.g. Nitrogen. It is important that the compressed air / inert gas supply is capable of delivering the quantity required for purging and still maintaining sufficient supply pressure. This means ensuring adequate size of pipe and airline accessories. Over 80% of commissioning problems reported to Expo are due to **inadequate sized piping or air supply.** Although MiniPurge units all include a filter, the compressed air / inert gas supply should be from a clean dry source, and should have a dedicated local air pressure regulator. Minimum air supply pressure 4 bar/ 60 psig / 4MPa. The pressure is to be maintained whilst purging at normal purge flow rate.

Purge air from Control Unit to pressurized enclosure.
When the control unit is directly top mounted onto the pressurized enclosure, no connection will normally be necessary, as the purge air will discharge into the pressurized enclosure directly. When the control unit is not top mounted, or where internal air distribution is necessary a connection should be made from the purge air outlet on the control unit (normally ½" NPT Female), via pipe pressure rated at least to the supply pressure, to the pressurized enclosure. This should be kept as short as possible and should be adequately sized to ensure that the full purge flow can be delivered.

Control Unit to enclosure pressure monitor.
When the control unit is directly top mounted onto the pressurized enclosure, no connection will normally be necessary, as the enclosure pressure monitor point will sense directly inside the pressurized enclosure. Only if the control unit is not directly mounted or if there are fans, which may create, localised low-pressure areas within the pressurized enclosure is it necessary to pipe this connection. The connection is made to the enclosure pressure sensor fitting (normally 1/8" NPT Female) on the control unit. There is virtually no flow in this circuit so small bore tube may be used. Expo recommends 6mm (¼") bore metallic tube. However it is important that all connections are free of leaks.

Control unit to flow sensor.
For Continuous Flow (**CF**) systems this function is performed by the enclosure pressure sensor monitor connection. On Leakage Compensation (**LC**) systems this connection is made from the enclosure flow sensor fitting (normally 1/8" NPT Female) on the control unit, to the fitting (normally 1/8" NPT Female) on the relief valve (RLV). Again, Expo recommends 6mm (¼") bore metallic tube.

Power supplies and their isolation
All power entering the pressurized enclosure shall be provided with a means of isolation. This requirement also applies to any external power sources, which are connected to equipment such as "volt-free" or "dry" contacts within the pressurized enclosure. Printer signal, network cards etc need isolation.

Exception: Power to Intrinsically Safe, or other apparatus that is classified for the hazardous area need not be isolated by the Expo system. In all cases the application and the isolation of the power must be controlled by the MiniPurge system. Refer to Specification Sheet for output options available.

Adjustments and settings

The user adjustable settings are as follows:

Purge time
For continuous flow (CF) systems only – purge flow rate orifice size selection
Leakage compensation
Action on pressurization failure

Purge time

If no specific purge test has been performed on the pressurized enclosure, the volume of the pressurized enclosure must be determined by the manufacturer or user of the pressurized enclosure and the necessary purging time calculated based on the purge flow rate specified by the "standard" being used. It is the user's responsibility to verify or enter this data on the pressurized enclosure and/or MiniPurge system nameplate. Ask Expo if in doubt. The European standard EN 50016 (2nd edition) states that a purge test must be completed to verify effective purging. EN50 016 (1st edition) permitted 5 free volume changes and an example of the calculations are as follows:-

If the pressurized enclosure external dimensions indicate an internal free volume of 500 Litres then, $\frac{\text{500 litres enclosure volume x 5 volume changes}}{\text{225 litres/minute purge flow rate}}$ = 12 minutes purge time

If the pressurized enclosure is a motor, experience of purge testing shows that it is prudent to multiply the motor internal "free" volume by ten to get the purging volume.

$\frac{\text{500 litres enclosure volume x 10 volume changes}}{\text{225 litres/minute purge flow rate}}$ = 23 minutes purge time

The following applies for NFPA 496 standards where 4 complete volume changes are permitted for enclosures except when the pressurized enclosure contains a motor when 10 volume changes are required.

If the pressurized enclosure external dimensions indicate a total volume of 8 cubic foot, then,

$\frac{\text{8 cubic foot enclosure volume x 4 volume changes}}{\text{8 cubic foot/minute purge flow rate, (see above)}}$ = 4 minutes purge time

If the same pressurized enclosure contains a motor, then,

$\frac{\text{8 cubic foot enclosure volume x 10 volume changes}}{\text{8 cubic foot/minute purge flow rate, (see above)}}$ = 10 minutes purge time

The standard MiniPurge units have the patented digital pneumatic timer system as shown in *Figure 10 Mini purge timer block*. The purge time is set by opening / closing the pinch valve so that the sum of the open valve times equals or exceeds the required purge time. **At least one valve must always be open, and the screws must be at the appropriate limit of travel. Do not over tighten.**

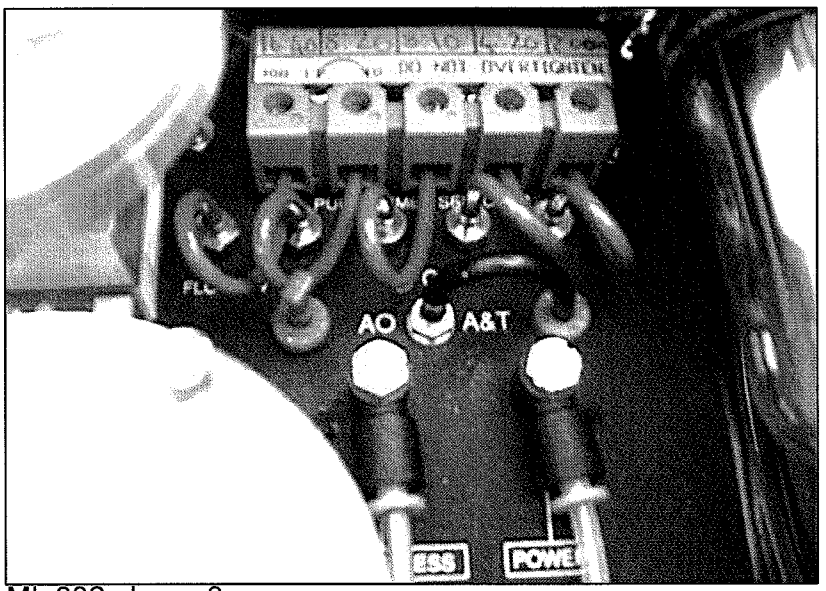


Figure 10 Mini purge timer block

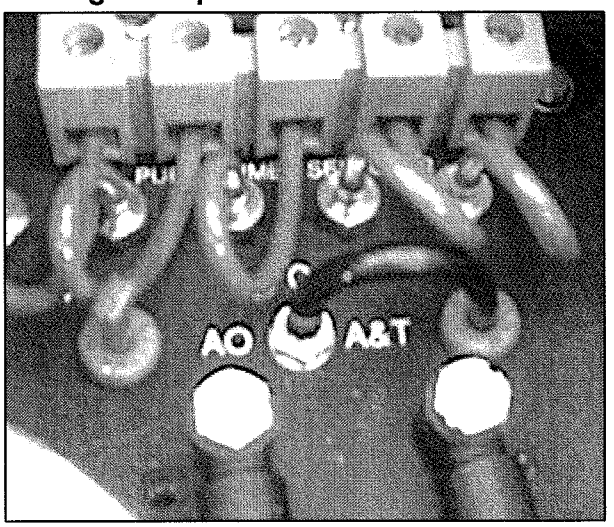
Purge flow rate for CF (continuous flow) systems.
The purge flow rate is selected by placing the appropriate orifice plate in the SAU (spark arrestor unit). The purge flow rates given in the Table 2 below are based on standard setting of the flow sensor of 2.5mbar, 1 in wc, 250Pa. For leakage compensation systems the purge flow rate is set by the selection of the relief valve and is not user adjustable.

Orifice plate number	Continuous flow rate with 2.5 mbarg, 1 in wc, 250 Pa flow sensor set point	
	N litre/minute	SCFM
1	10	0.4
2	25	0.9
3	40	1.4
4	65	2.3
5	90	3.2
6	135	4.8
7	180	6.4
8	225	8.0

Table 2 Purge Flow Rates

Action on loss of pressurization
The action on loss of pressurization is the responsibility of the user.
The action on loss of pressurization can be set to ALARMS ONLY (AO), or ALARM AND AUTOMATIC DISCONNECT OF POWER (A&T).

Leakage Compensation



The action on loss of pressurization is set by moving the jumper tube (see Figure 15 Action on loss of pressurization jumper tube). The standard setting is alarm and trip where the link is from C to A&T, with a plug in AO. Changing to alarm only is user adjustable by moving the link from C to AO, and plugging A&T.

Figure 11 Action on loss of pressurization jumper tube

Continuous Flow
The standard CF system is built set to alarm and trip. Alarm only can be installed when order specified or supplied as a retrofit kit later. See options.

The selection for action on loss of pressurization depends on the area of operation and the following guidelines should be followed.
The user must make use of this alarm facility in accordance with the local code of practice for "action on pressure or flow failure". Most codes include the following recommendations:
Zone 1 Installations:
Alarm and automatic disconnect of power.
Exception: If the equipment inside the pressurized enclosure is suitable for use in Zone 2, the power trip may be performed manually, (no automatic power trip), if the pressure or flow failure persists for an unacceptable time.

Zone 2 Installations:
Alarm only on pressure or flow failure with power being removed manually by turning off the air supply to the MiniPurge system if the failure persists for an unacceptable time.

Class I Division 1 Installations:
Alarm and Automatic Trip of Power. Note: NFPA 496 2-10.1 states power to the circuits shall be permitted to be continued for a short period if immediate loss of power would result in a more hazardous condition and if both audible and visual alarms are provided at a constantly attended location.

Class I Division 2 Installations:
Where automatic timing is preferred, Alarm only on pressure or flow failure with power being removed manually by turning off the air supply to the MiniPurge system if the failure persists for an unacceptable time.

Commissioning

Start by check that the system has been installed in accordance with this manual.
Disconnect the supply pipe from the inlet to the MiniPurge system and blow it through for at least 10 seconds per metre (3ft) of length to remove any debris or condensation.
Connect a temporary pressure gauge or water manometer to the pressurized enclosure or MiniPurge system pressure test point (Remove the red plug on the low pressure sensor and connect 4mm OD nylon tube).

Figure 12. PE or MiniPurge system pressure test point

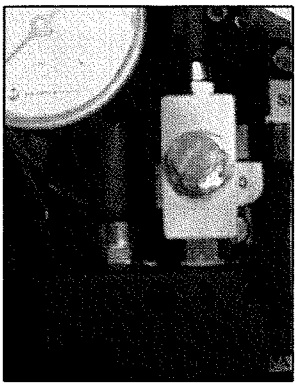
Unless a supply shut-off valve has been specially fitted inside the MiniPurge system, it may be advisable to install an external shutoff valve with the same, or larger, thread size as the MiniPurge control unit inlet fitting upstream of the connection.

Continuous Flow (CF) Systems

Open the flow control valve (FCV) until the alarm/pressurized indicator just turns from red to green. Clockwise will reduce the flow and anti-clockwise will increase the airflow.
If the flow control valve (FCV) is opened fully and the indicator has still not turned green, check the air supply pressure **at the inlet to the control unit while flow is taking place**. It must be above the minimum 4 bar/ 60 psig/ 400Kpa specified.
Figure 13. Flow control valve (FCV) below.

Check that the internal logic gauge reads 2bar /30 psig/200KPa.
The purge timer will start as soon as the 'alarm/pressurized' indicator turns from red (alarm) to green (pressurized). Check that the time delay between the indicator turning green and the application of power to the pressurized enclosure is not less than the minimum time required to purge the pressurized enclosure. When the purge time has been completed, the 'purge complete' indicator will turn from red to green.
After the power has been turned on by the control unit, the air flow will continue at the same rate to provide cooling or dilution as required.

Leakage compensation systems (LC)



Open the leakage compensation valve (LCV) fully, turn anti-clockwise. Clockwise will reduce the flow and anti-clockwise will increase the airflow.
Open the supply regulator SLOWLY and allow the pressurized enclosure pressure to rise until the relief valve (RLV) opens. Check that the RLV opens at or below the figure specified in the documentation.
Note tolerance of ± 2 mbarg / 0.8 in wc / 200Pa.
Repeat the test several times.
Open the supply regulator to between 4 and 8 barg / 60 and 115 psi / 400 and 800 Kpa and the purging flow will start.
Check that the internal logic gauge reads 2bar /30 psi / 200 Kpa

Figure 14 Leakage compensation valve

At this time the "alarm/pressurized" indicator should be green and the "purging" indicator should be yellow. If the yellow indicator remains black the flow through the relief valve is below the minimum for which the flow sensor has been calibrated. Check the air supply pressure at **the inlet to the control unit while purging is taking place**. It must be above the minimum specified.

The purge timer will start as soon as the "purging" indicator turns yellow. Check that the time delay between the "purging" indicator turning yellow and the application of power to the pressurized enclosure is not less than the minimum time required purging the pressurized enclosure. Times in excess of the minimum are permitted and a tolerance of +20% is normally acceptable. If the time is too short it must be increased accordingly.

After the power has been applied via the control unit, the purging valve will close and the air flow into the enclosure will be controlled by the leakage compensation valve (LCV). The initial setting of fully open will normally be too high. It should now be adjusted to set the pressurized enclosure pressure and leakage. There are three possible situations:-

Air continues to come out through the RLV Spark Arrestor after power has been applied in considerable quantity. The LCV is much too far open and the air flow is holding the RLV open continuously.
Close the LCV slowly. The pressurized enclosure pressure will start to fall as the flow decreases but eventually the RLV will close and the enclosure pressure rise again. At this point the Relief Valve may start to open intermittently as the pressurized enclosure pressure rises to the point where it exceeds the RLV opening pressure. When the RLV opens the pressure will fall quickly to the point where the RLV re-closes and the enclosure pressure starts to rise again. This is entirely normal for this type of RLV.

If the Relief Valve is opening intermittently the LCV is slightly too far open. When the RLV opens the enclosure pressure falls quickly to the point where the RLV re-closes and the enclosure pressure starts to rise again. This is entirely normal for this type of RLV and shows that it is working correctly.
Continue then to close the LCV until the cycling stops and the enclosure pressure starts to fall. Carefully adjust the LCV until the pressurized enclosure pressure is approximately 50% of the RLV opening pressure and stable. This pressure may be around 5 mbarg / 2 in wc / 500 Pa and will be the "normal working pressure".

We recommend that the setting of the minimum pressure sensor is checked at this time. Note the position of the LCV knob. (A pencil mark placed on the knob at "12 O'clock" can be used). Slowly lower the pressurized enclosure pressure by closing the LCV further, counting the number of turns from the "normal working pressure" position. Note the pressure at which the "alarm/pressurized" indicator turns from green to red and check that it is not lower than the figure given in the documentation. Check also the "alarm" electrical contacts. As soon as the "alarm/pressurized" indicator turns red, the system will start to re-purge. If alarm and trip function is selected the enclosure power will be switched off.

While it is re-purging return the LCV to its "normal working pressure" position so that, at the end of purging, the enclosure pressure should immediately settle down at the correct "normal" pressure.

If, at the end of purging, the pressurized enclosure pressure falls below the minimum pressure sensor setting and the LCV is fully open, the system will start to purge again. This is indicative of excessive leakage from the enclosure. In this case, check the enclosure for leakage, and reduce or eliminate the leaks. This time, at the end of purging, the enclosure should stay pressurized and the relief valve action is as in a) or b) above. Proceed as described above.

Normal operation

Turn the air supply on or off to start or stop the system. After this the pressurizing and purging sequence is entirely automatic

Maintenance of the system

The maintenance recommended for the system consists of the following items, supplemented by any additional local requirements imposed by the local Code of Practice. Expo recommends that the commissioning tests be repeated at least every six months.

In addition the following checks are also recommended at that time:-

Check the RLV and all Spark Arrestors. Remove all debris & corrosion, or replace with a spare.

Check the condition of the air supply filter element. Clean or replace it as necessary.

At least every two years check the following additional items:-

Apparatus is suitable for the Hazardous location

There are no unauthorized modifications

The air supply must be to the correct quality, refer to section Air Quality.

The interlocks and alarms function correctly

Approval labels are legible and undamaged

Adequate spares are carried

The action on pressure failure is correct

Pressure sensor calibration

If it is decided that the minimum pressure /purge flow sensor needs recalibrating it must be returned to Expo for this service.

Filter cleaning

If the filter element needs cleaning the filter bowl can be unscrewed and removed. The filter element also unscrews and can then be cleaned in soapy water. Do not use solvents on any part of the filter assembly.

Fault Finding

If the system does not behave in the manner described above there is a fault. Some of the more likely faults are dealt with below. If a cure cannot be affected by following the procedure shown below please call Expo (24 hour answering) or your supplier for further assistance.

The system has been designed for ease of fault finding and the many of the components fitted are plug-in or manifold mounted. Check components by substitution only after establishing that such action is necessary. If the system is less than 12 months old, parts under warranty should be returned to Expo for investigation, with a full report of the fault and the system serial number.

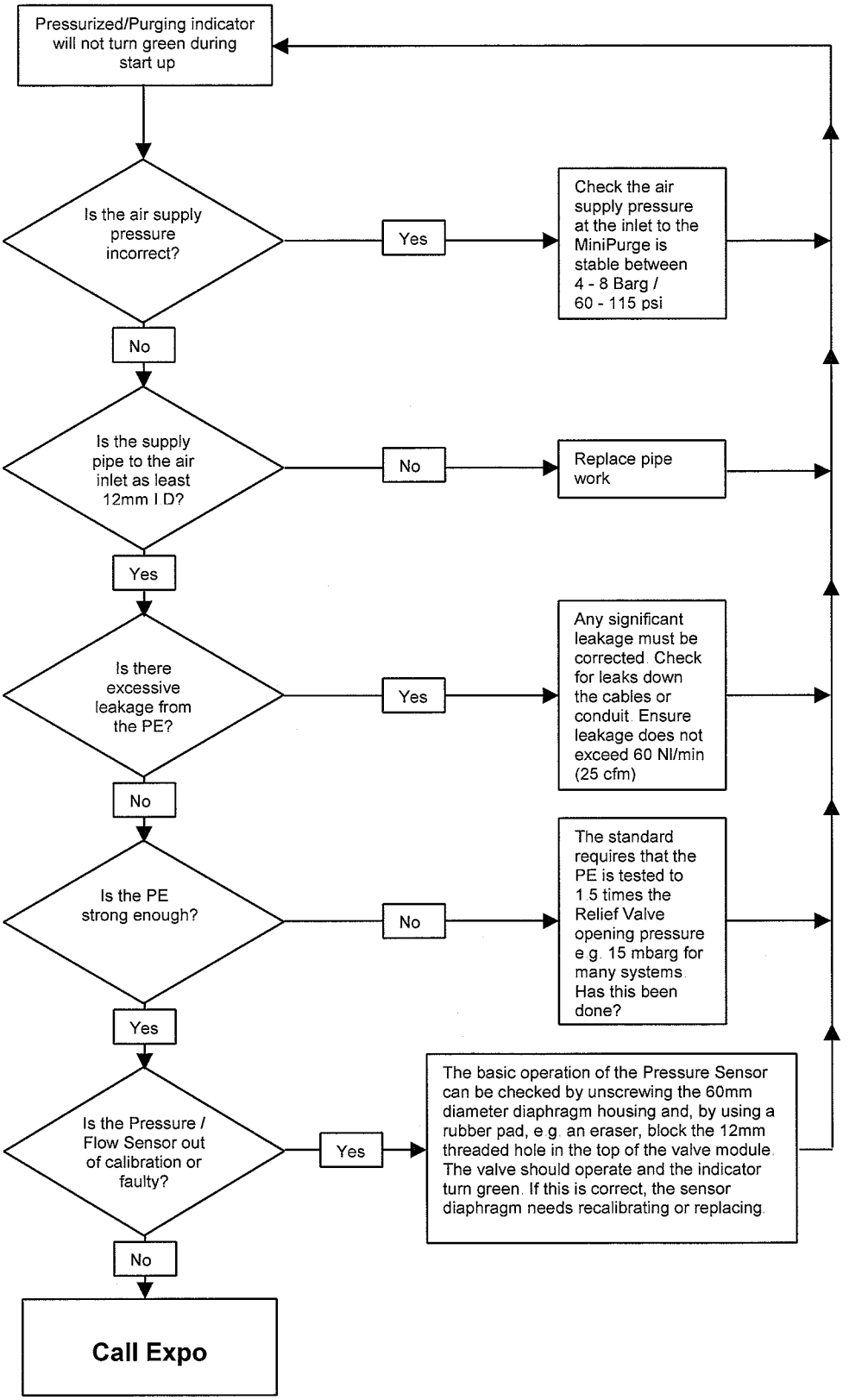
As with any pneumatic system the greatest enemies are water, oil and dirt in the air supply. For this reason the air system must always incorporate a dust and water filter. This can be part of the

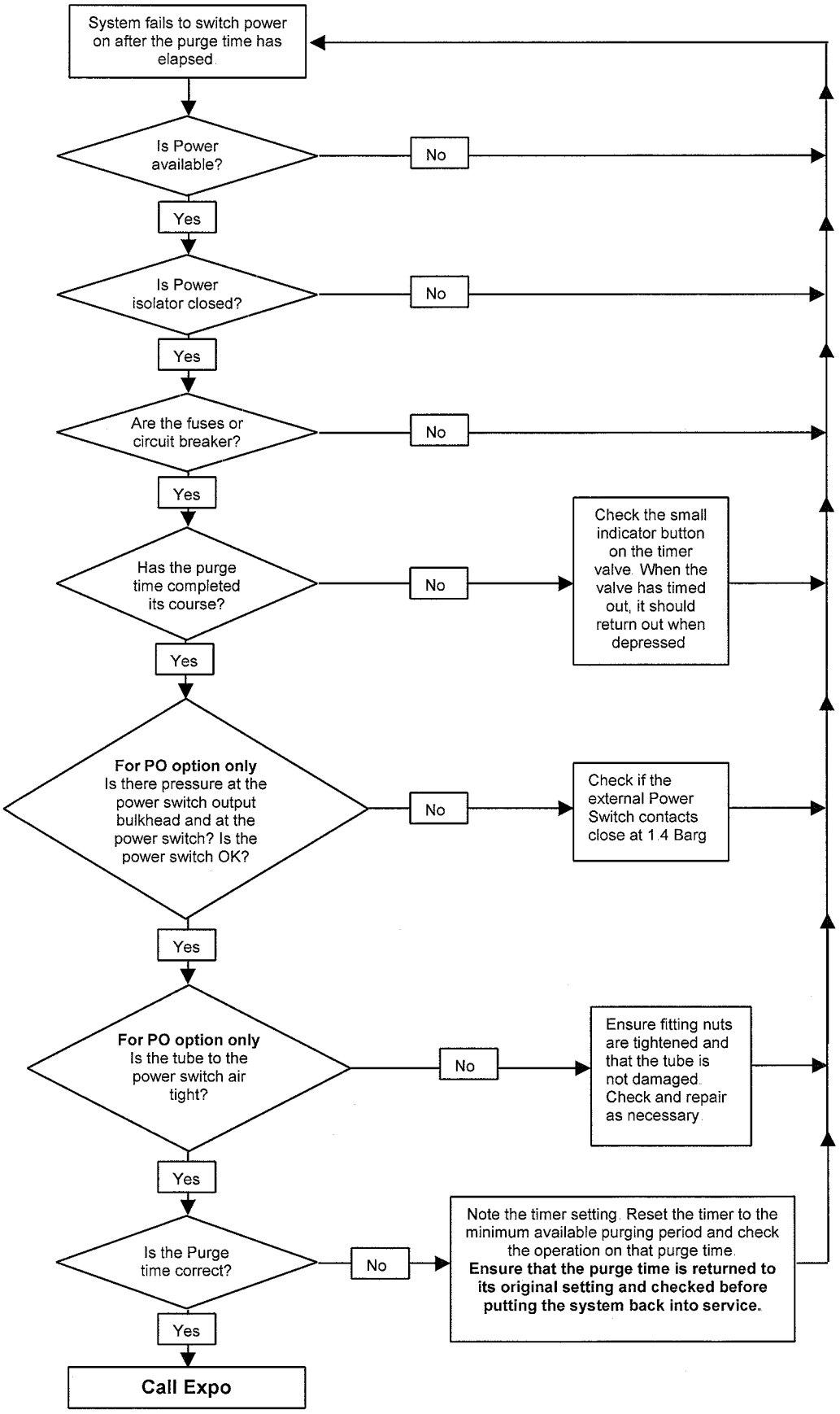
Expo system or can be provided by others. However dirt can enter from other sources and it is vital therefore that the procedures described in Section 2 is carried out before using the system for the first time, or following any disconnection of the pipe-work. Failure to perform this work may cause damage that will not be covered under warranty.

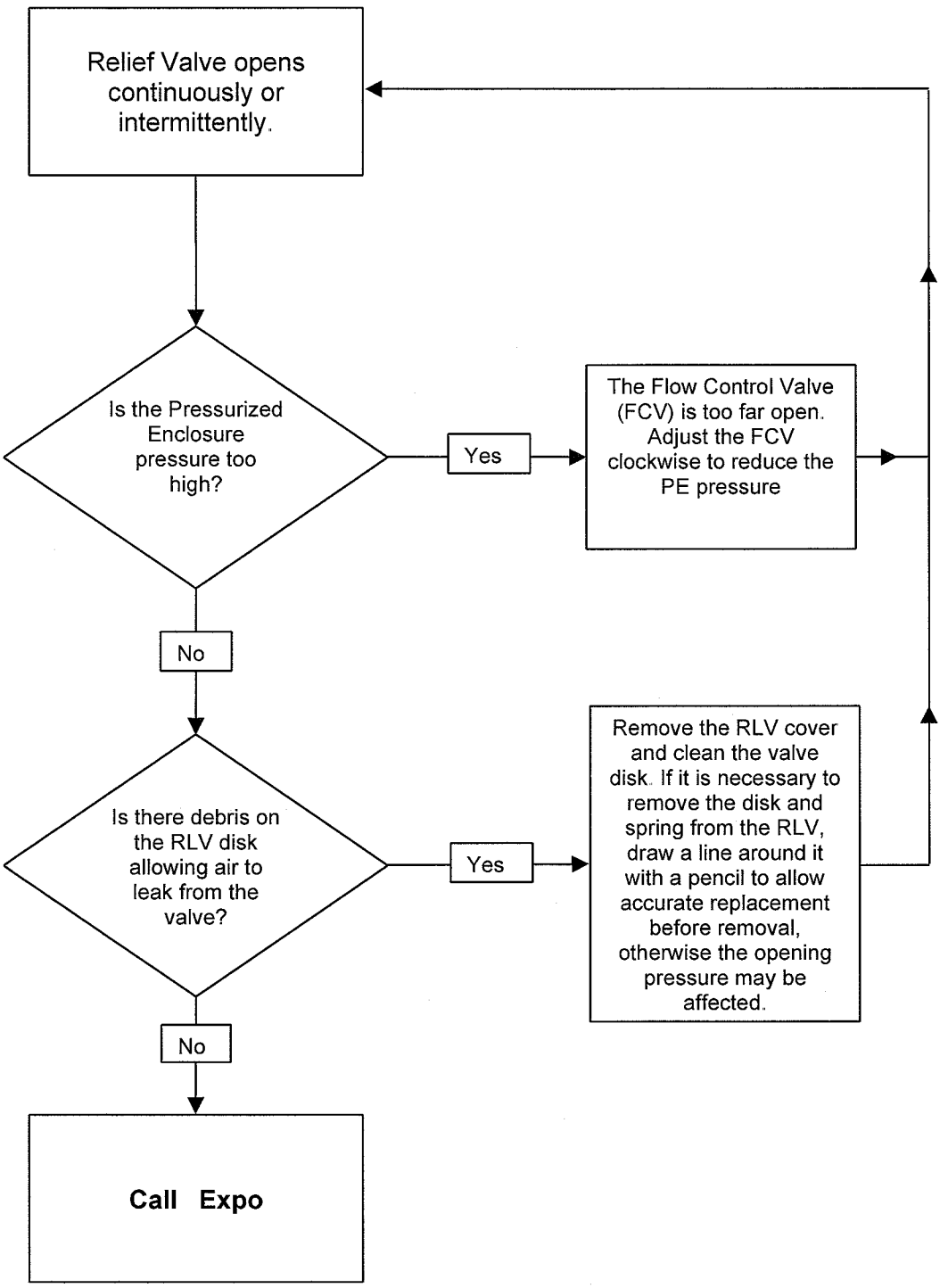
Before making the following checks verify that both the main air supply pressure to the purge system & the regulated pressure to the logic is as specified on the system specification sheet.

Different flow charts for faulting have been provided for both the CF and LC options.

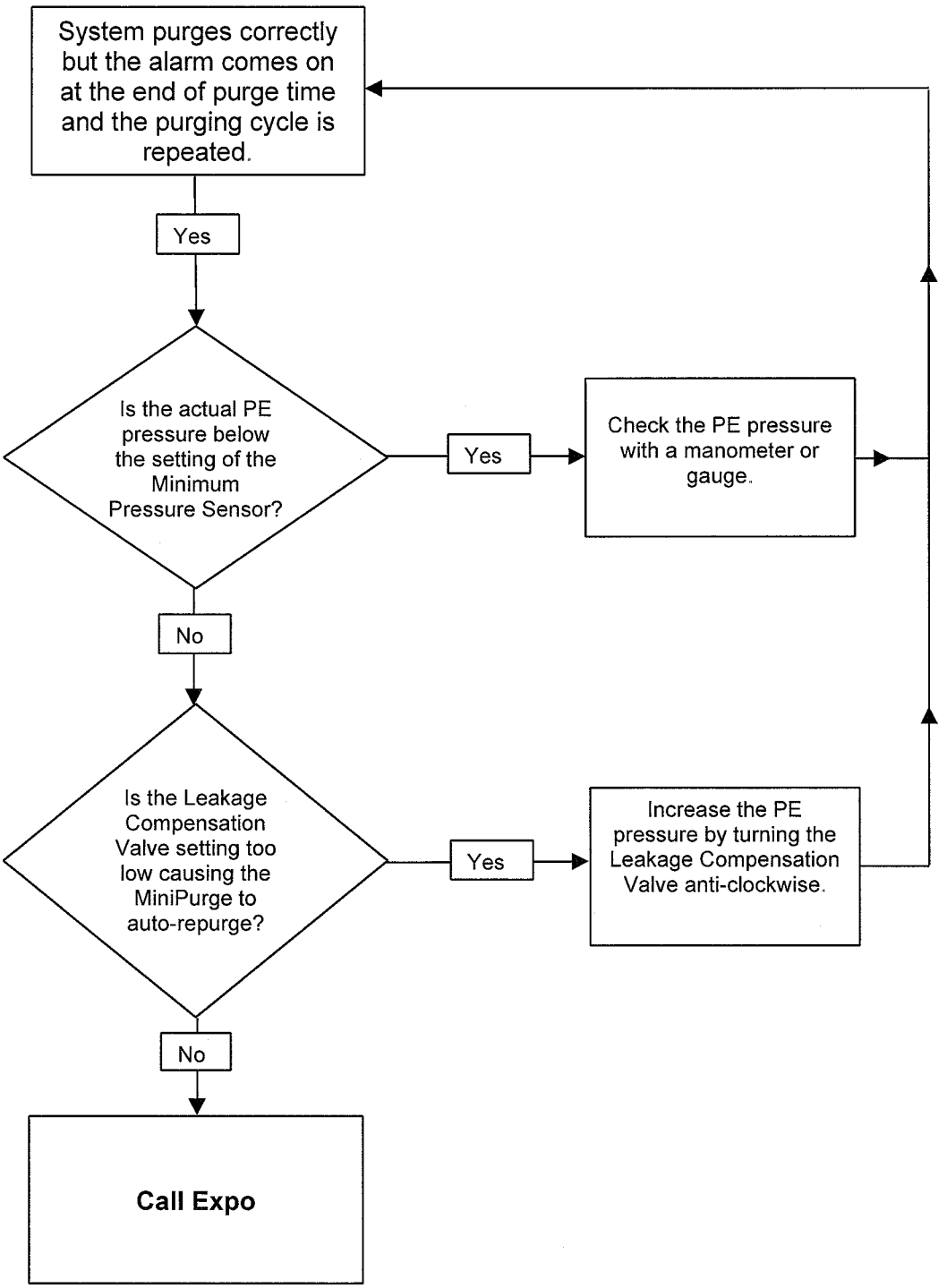
Fault Finding (CF)

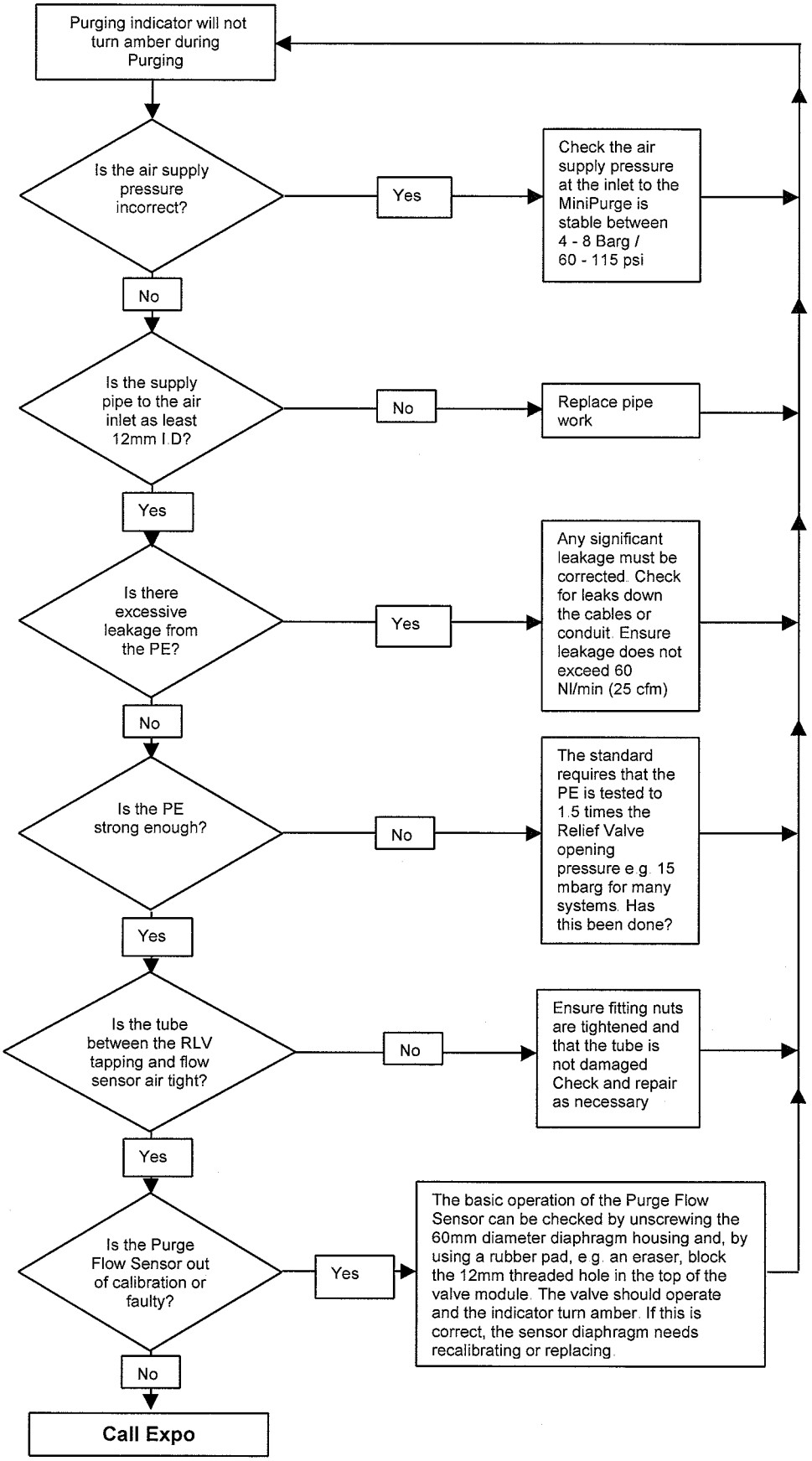


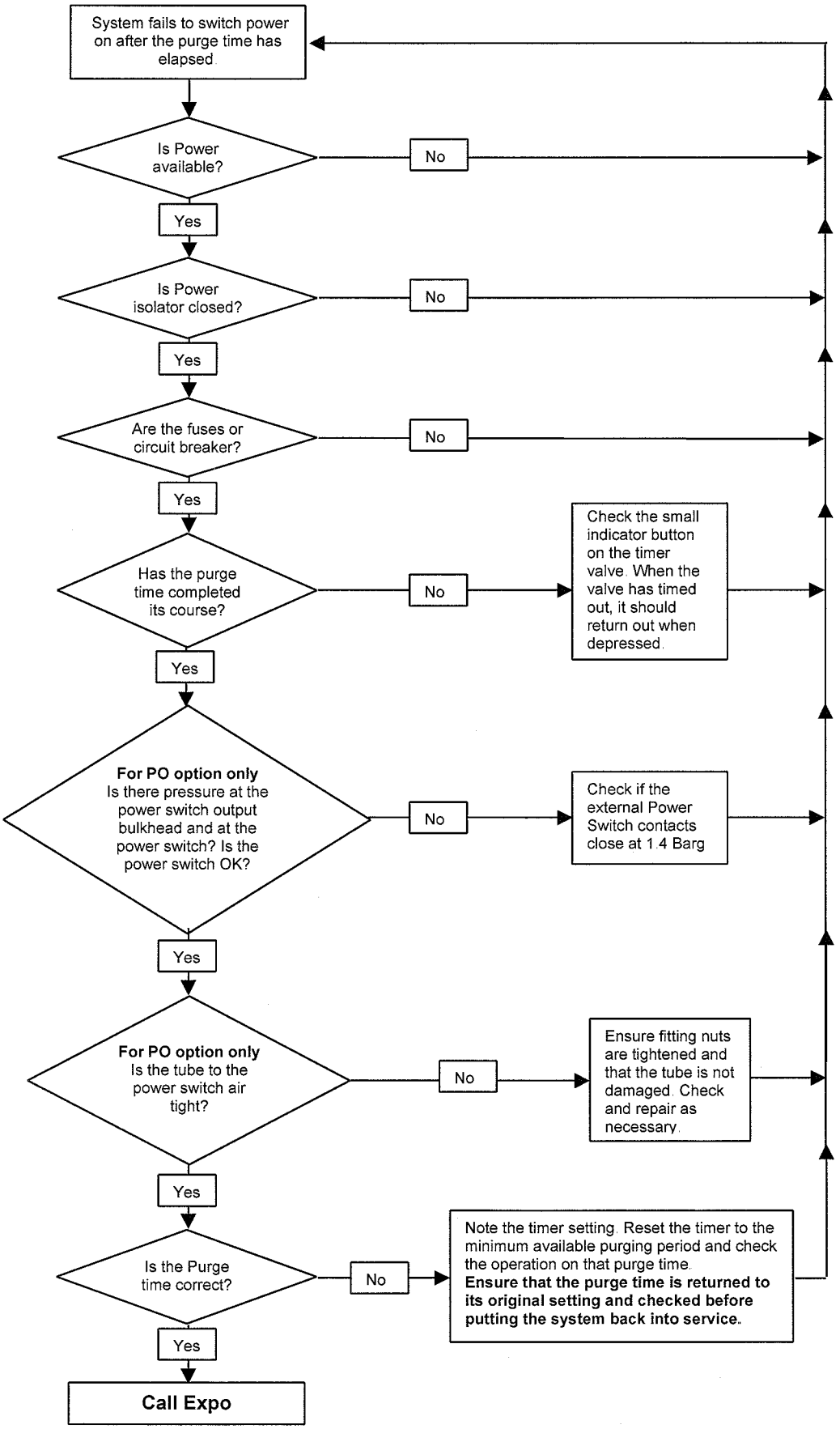

System fails to switch power on after the purge time has elapsed.
Is Power available?
No
Yes
Is Power isolator closed?
No
Yes
Are the fuses or circuit breaker?
No
Yes
Has the purge time completed its course?
No
Check the small indicator button on the timer valve. When the valve has timed out, it should return out when depressed
Yes
For PO option only
Is there pressure at the power switch output bulkhead and at the power switch? Is the power switch OK?
No
Check if the external Power Switch contacts close at 1.4 Barg
Yes
For PO option only
Is the tube to the power switch air tight?
No
Ensure fitting nuts are tightened and that the tube is not damaged. Check and repair as necessary.
Yes
Is the Purge time correct?
No
Note the timer setting. Reset the timer to the minimum available purging period and check the operation on that purge time.
Ensure that the purge time is returned to its original setting and checked before putting the system back into service.
Yes
Call Expo

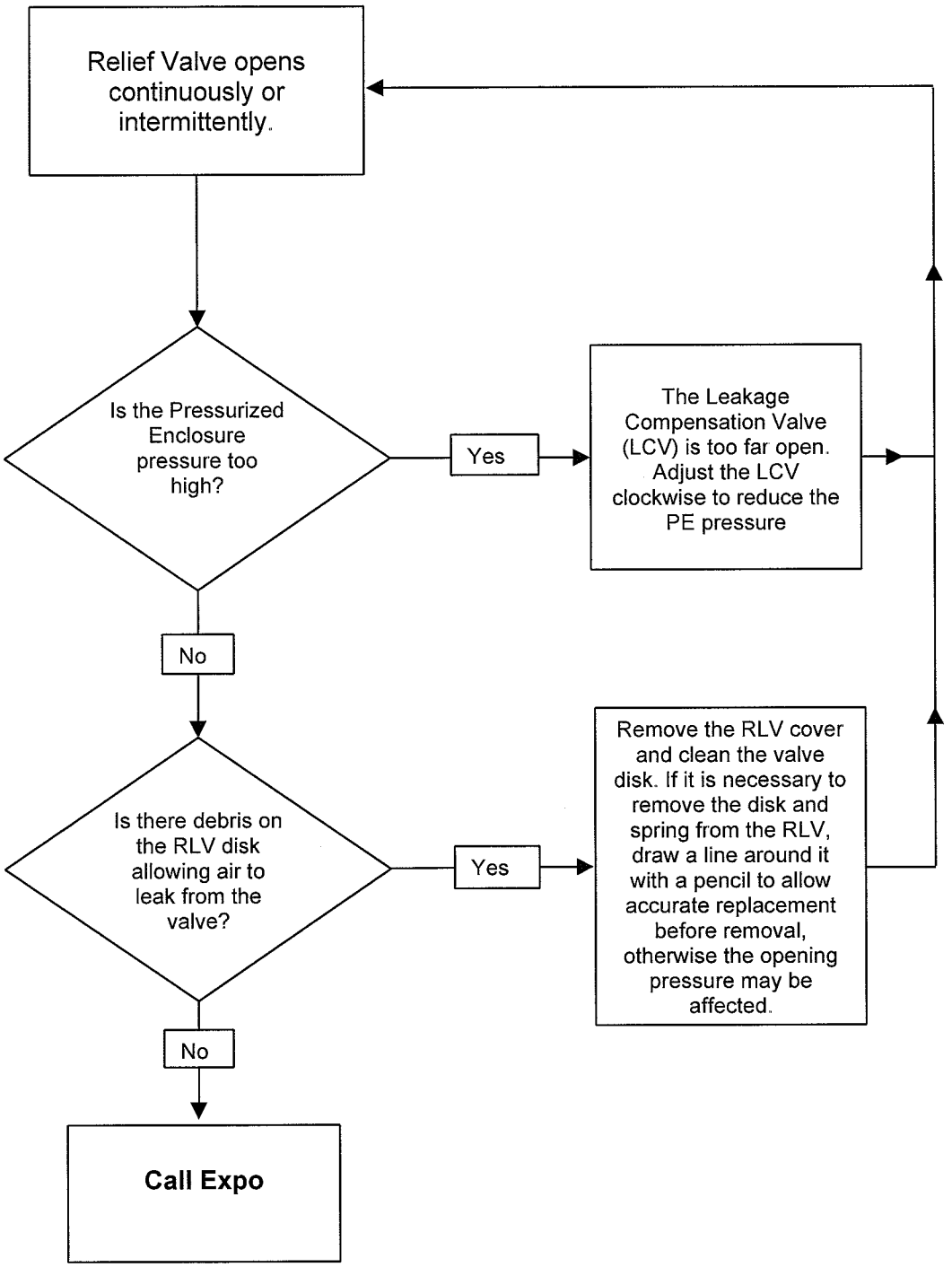

Relief Valve opens continuously or intermittently.
Is the Pressurized Enclosure pressure too high?
Yes
The Flow Control Valve (FCV) is too far open. Adjust the FCV clockwise to reduce the PE pressure
No
Is there debris on the RLV disk allowing air to leak from the valve?
Yes
Remove the RLV cover and clean the valve disk. If it is necessary to remove the disk and spring from the RLV, draw a line around it with a pencil to allow accurate replacement before removal, otherwise the opening pressure may be affected.
No
Call Expo

Fault Finding (LC)




Purging indicator will not turn amber during Purging
Is the air supply pressure incorrect?
Yes
Check the air supply pressure at the inlet to the MiniPurge is stable between 4 - 8 Barg / 60 - 115 psi
No
Is the supply pipe to the air inlet as least 12mm I.D?
No
Replace pipe work
Yes
Is there excessive leakage from the PE?
Yes
Any significant leakage must be corrected. Check for leaks down the cables or conduit. Ensure leakage does not exceed 60 Nl/min (25 cfm)
No
Is the PE strong enough?
No
The standard requires that the PE is tested to 1.5 times the Relief Valve opening pressure e.g. 15 mbarg for many systems. Has this been done?
Yes
Is the tube between the RLV tapping and flow sensor air tight?
No
Ensure fitting nuts are tightened and that the tube is not damaged Check and repair as necessary
Yes
Is the Purge Flow Sensor out of calibration or faulty?
Yes
The basic operation of the Purge Flow Sensor can be checked by unscrewing the 60mm diameter diaphragm housing and, by using a rubber pad, e.g. an eraser, block the 12mm threaded hole in the top of the valve module. The valve should operate and the indicator turn amber. If this is correct, the sensor diaphragm needs recalibrating or replacing.
No
Call Expo


System fails to switch power on after the purge time has elapsed.
Is Power available?
No
Yes
Is Power isolator closed?
No
Yes
Are the fuses or circuit breaker?
No
Yes
Has the purge time completed its course?
No
Check the small indicator button on the timer valve. When the valve has timed out, it should return out when depressed.
Yes
For PO option only
Is there pressure at the power switch output bulkhead and at the power switch? Is the power switch OK?
No
Check if the external Power Switch contacts close at 1.4 Barg
Yes
For PO option only
Is the tube to the power switch air tight?
No
Ensure fitting nuts are tightened and that the tube is not damaged. Check and repair as necessary.
Yes
Is the Purge time correct?
No
Note the timer setting. Reset the timer to the minimum available purging period and check the operation on that purge time.
Ensure that the purge time is returned to its original setting and checked before putting the system back into service.
Yes
Call Expo


Relief Valve opens continuously or intermittently.
Is the Pressurized Enclosure pressure too high?
Yes
The Leakage Compensation Valve (LCV) is too far open. Adjust the LCV clockwise to reduce the PE pressure
No
Is there debris on the RLV disk allowing air to leak from the valve?
Yes
Remove the RLV cover and clean the valve disk. If it is necessary to remove the disk and spring from the RLV, draw a line around it with a pencil to allow accurate replacement before removal, otherwise the opening pressure may be affected.
No
Call Expo

Approval Documents

System type	Approval authority	Certificate number
X purge	Sira	01ATEX 1295X
	FM	1X8A4.AE
	UL	E190061
	*Standards Australia	*Ex 3199U

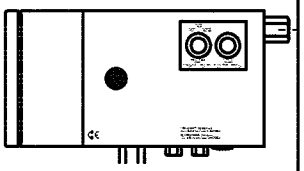
For PA option only	Approval authority	Certificate number
Ex e junction box	Baseefa	Baseefa04ATEX0218
EEx d switches	PTB	00 ATEX 1093X

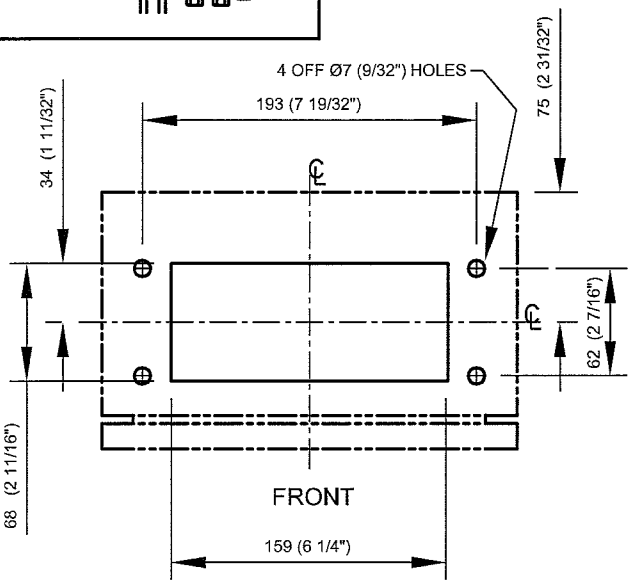
*Available upon request

Glossary

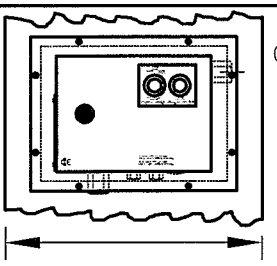
Acronym	Description
A&T	Alarm and trip
AO	Alarm only
CF	Continuous flow
CU	Control unit
FCV	Flow control valve
FM	Factory Mutual
IS	Intrinsically safe
LC	Leakage compensation
LCV	Leakage compensation valve
MIU	MiniPurge Interface Unit
PA	Ex d power and alarm switch wired to Ex e terminal box
PE	Pressurized Enclosure
PO	Pneumatic output
RLV	Relief valve
SAU	Spark arrestor universal

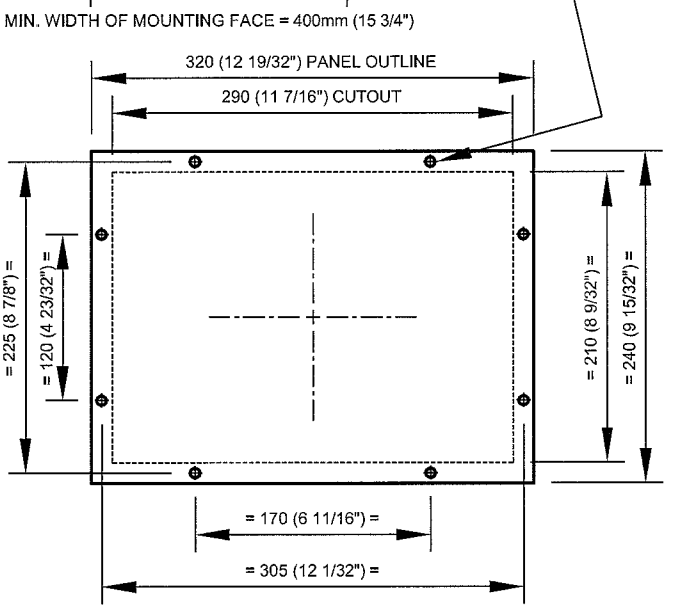
PREFERED OPTION
DIRECT MOUNT
(ON TOP OF ENCLOSURE)



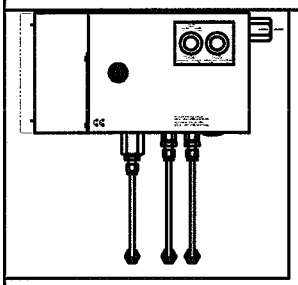


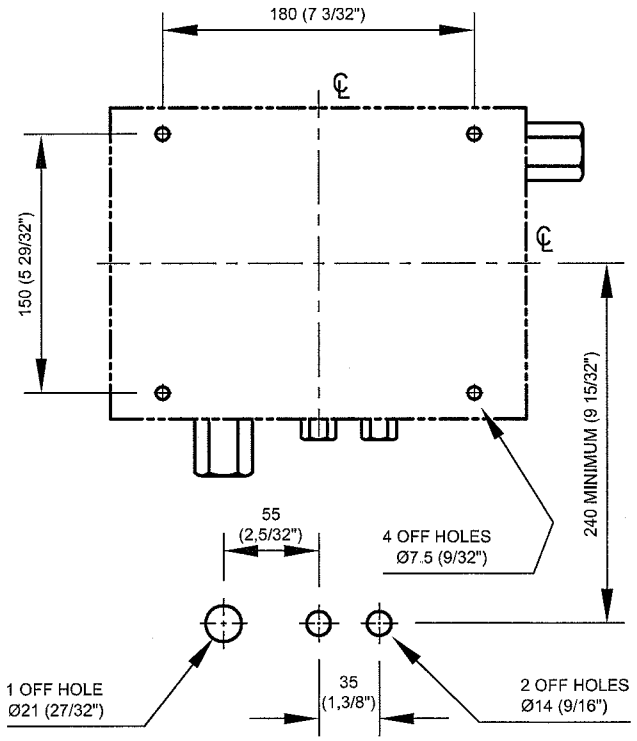
PANEL MOUNT
(ON FRONT OR SIDE OF ENCLOSURE)



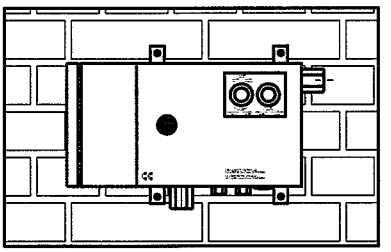


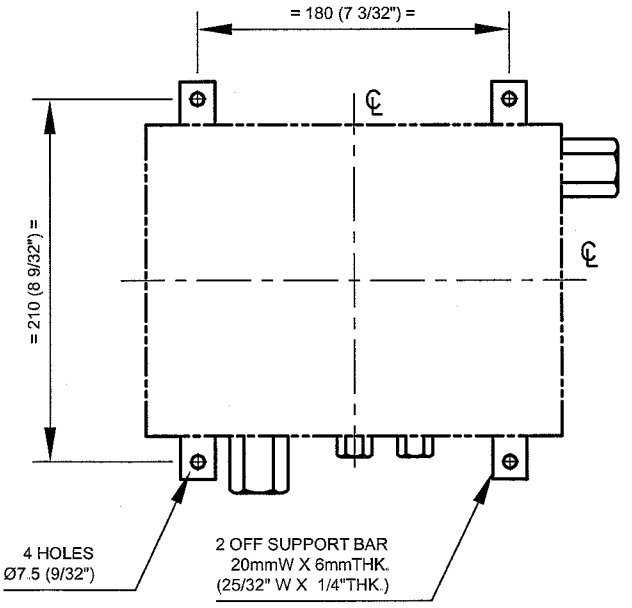
REAR MOUNT
(ON SIDE OF ENCLOSURE)





REMOTE MOUNT
(ON WALL OR PANEL)





XBR-7TD0-004 ISSUE 3

Sub MiniPurge Systems
MOUNTING DETAILS

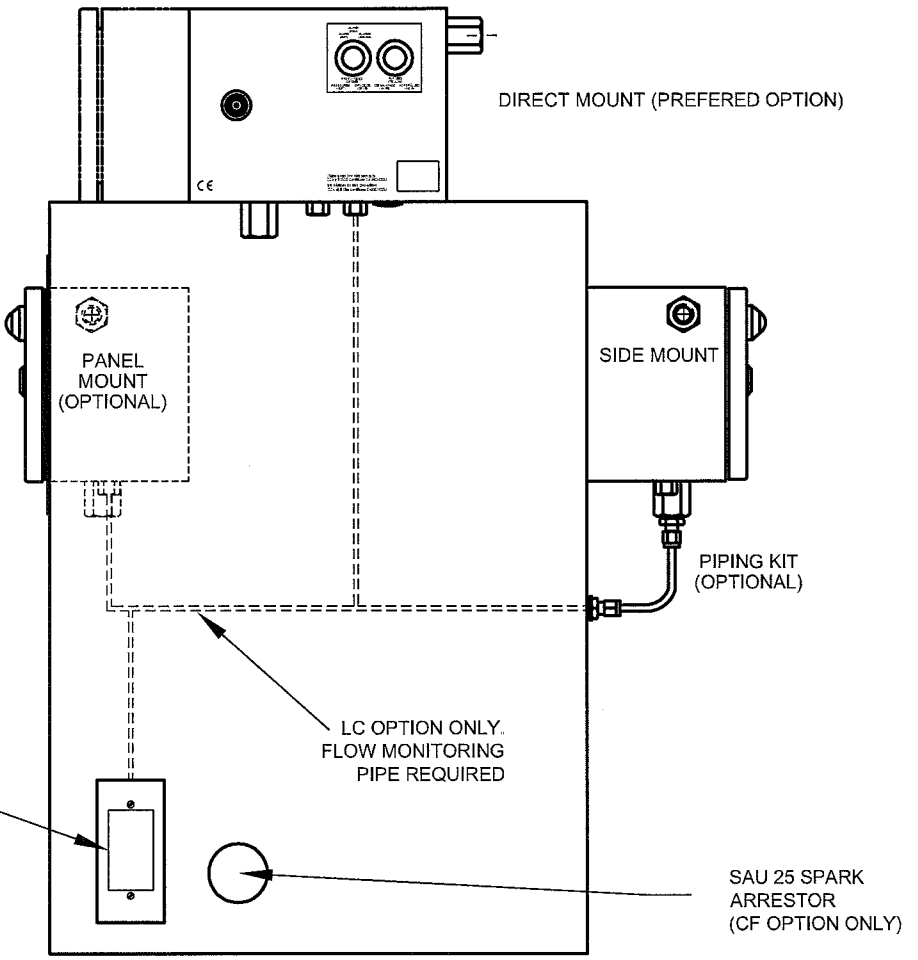
MiniPurge CONFIGURATION

NOTES:

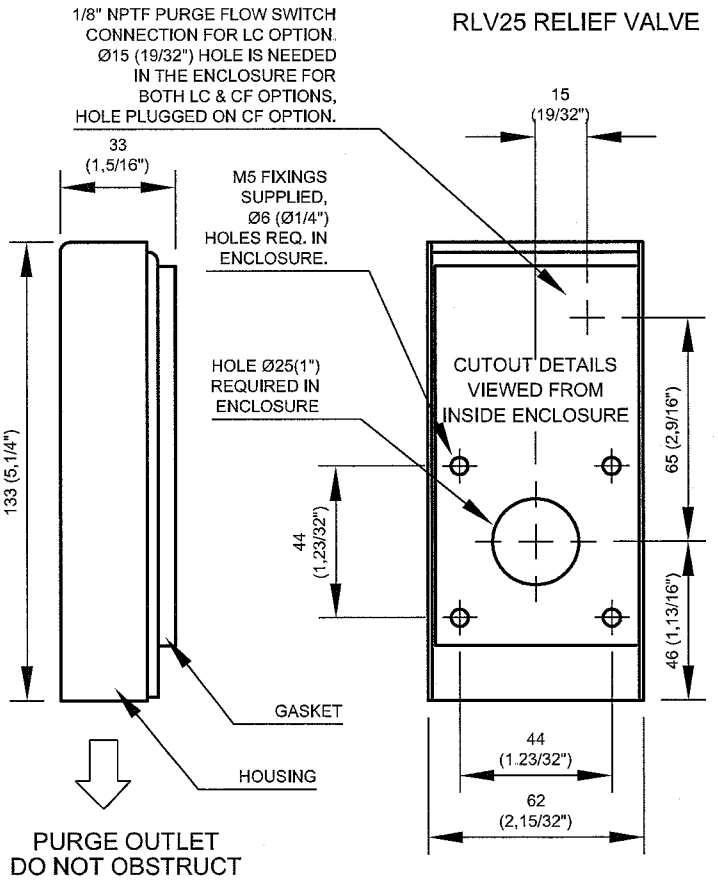
1) USE DIRECT MOUNTING WHEREVER POSSIBLE, WALL MOUNTING BRACKETS AND PIPING KITS FOR SIDE MOUNTING ARE OPTIONAL

2)MINIPURGE MUST BE MOUNTED IN THE POSTIONS SHOWN.

3)PURGE AIR TO VENT INTO TOP OF THE ENCLOSURE AND EXIT THROUGH THE RELIEF VALVE/SPARK ARRESTOR AT THE BOTTOM OF THE ENCLOSURE

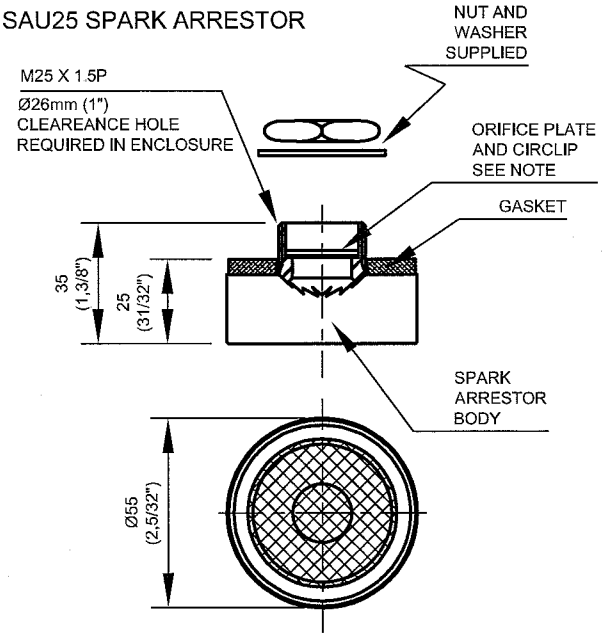


RLV25 RELIEF VALVE



WEIGHT = 0.5 kg (`1.1 lb)

SAU25 SPARK ARRESTOR



WEIGHT = 0.2 kg (0.44 lb)

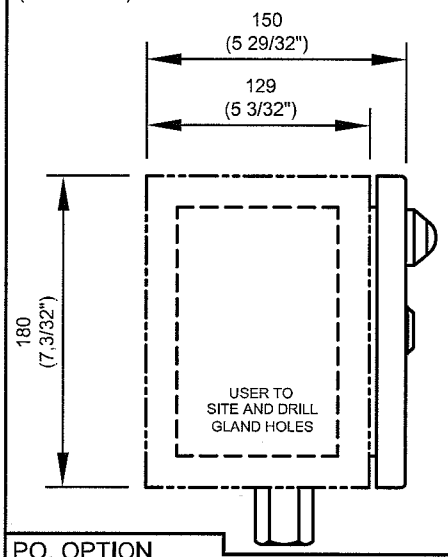
NOTE:-

SYSTEMS SUPPLIED WITHOUT ENCLOSURES ARE SUPPLIED WITH A RANGE OF 8 ORIFICE PLATES TO SUIT FLOW RATES BETWEEN 10-225 NL/MIN (0.4-8 SCFM)

Sub MiniPurge Systems CONFIGURATION

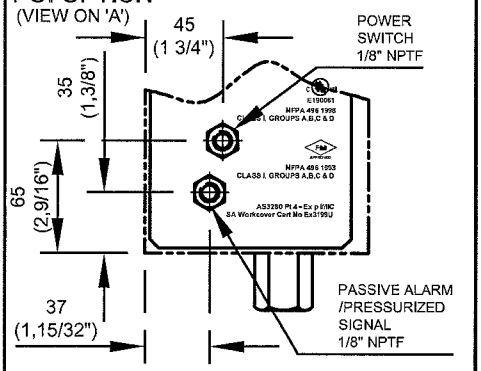
PA. OPTION (EUROPEAN CERT. ONLY)

(VIEW ON 'A')



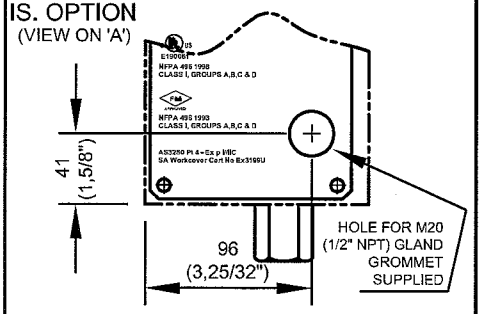
PO. OPTION

(VIEW ON 'A')

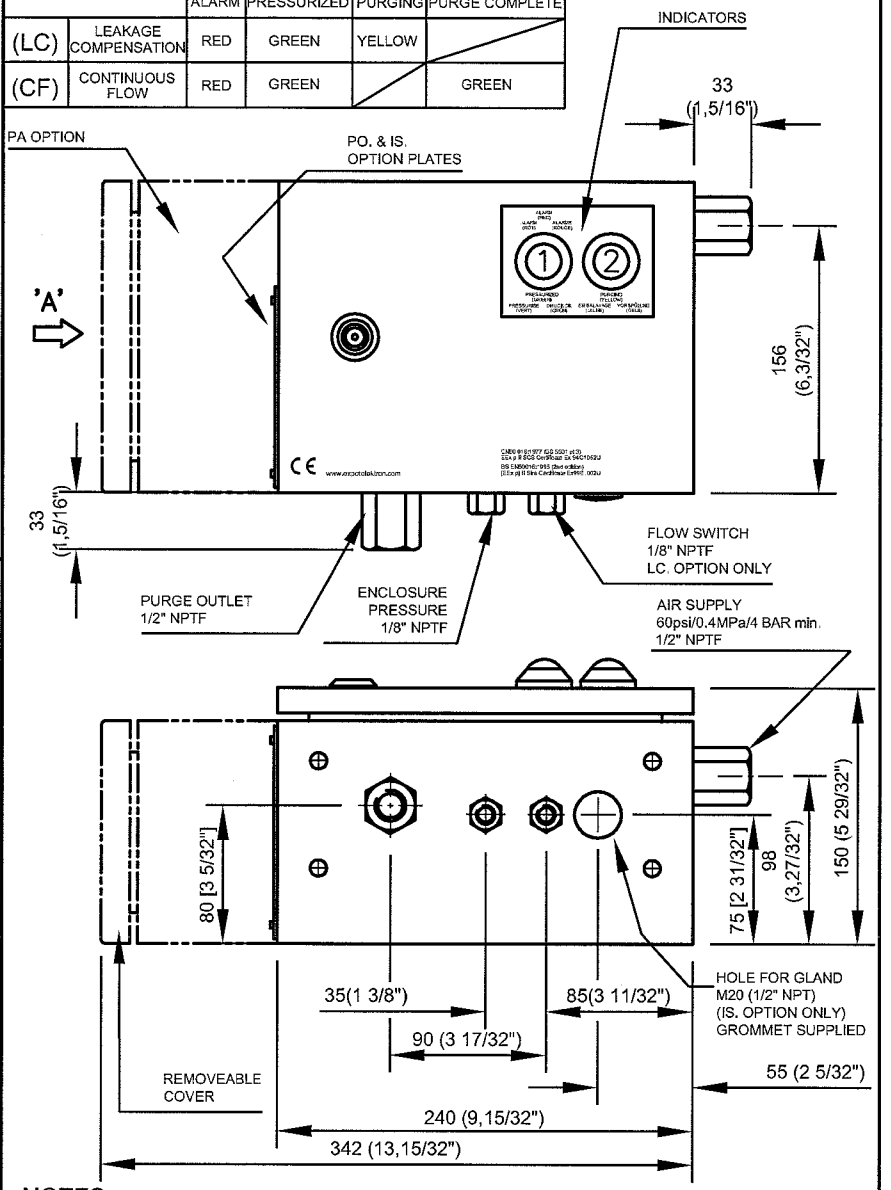


IS. OPTION

(VIEW ON 'A')

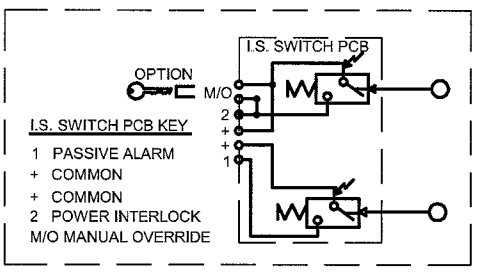


OPTION		INDICATOR 1		INDICATOR 2	
		ALARM	PRESSURIZED	PURGING	PURGE COMPLETE
(LC)	LEAKAGE COMPENSATION	RED	GREEN	YELLOW	
(CF)	CONTINUOUS FLOW	RED	GREEN		GREEN

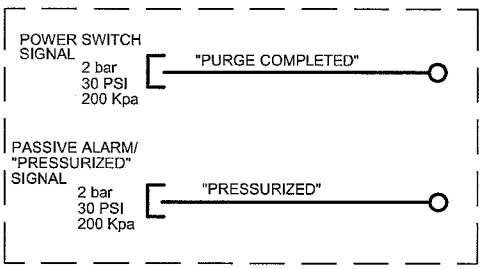


NOTES:

1) APPROXIMATE WEIGHT: 5 Kg [11 POUNDS]
2) EQUIVALENT IMPERIAL DIMENSIONS SHOWN IN BRACKETS.

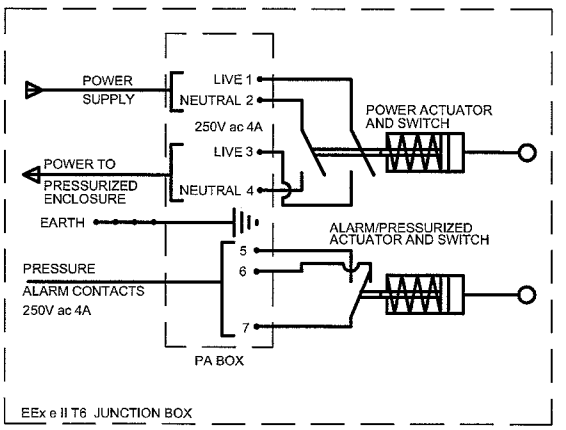


IS. OPTION



(MANUAL OVERRIDE OPTION AVAILABLE AS KEY SWITCH IN THE ENCLOSURE)

PO. OPTION



(MANUAL OVERRIDE OPTION AVAILABLE AS KEY SWITCH IN THE ENCLOSURE)

PA. OPTION

XBR-7TD0-002 ISSUE 4

Sub MiniPurge Systems
OVERALL DIMENSIONS

sira
Certification Service

1 **EC TYPE-EXAMINATION CERTIFICATE**

2 Equipment intended for use in Potentially Explosive Atmospheres Directive 94/9/EC

3 Certificate Number: Sira 01ATEX1295X

4 Equipment: Purge Controllers - Sub-MiniPurge, MiniPurge, Super-MiniPurge, Super-MiniPurge 1800/3500/7000/7000X

5 Applicant: Expo – Telektron Safety Systems Ltd

6 Address: Summer Road
Thames Ditton
Surrey
KT7 0RH
UK

7 This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 Sira Certification Service, notified body number 0518 in accordance with Article 9 of Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential report number R53A7169A and project number 51V8628.

9 Compliance with the Essential Health and Safety Requirements, with the exception of those listed in the schedule to this certificate, has been assured by compliance with the following documents:

EN 50014: 1997 +amendments 1,2
EN 50016: 1995

10 If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

11 This EC type-examination certificate relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment.

12 The marking of the equipment shall include the following:

⟨Ex⟩ II 2(2) G
[EEx p] II T6 (Ta = -20°C to +55°C)

Project Number 51V8628
Date 3 July 2002
C. Index 12

M D Shearman
Certification Manager

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Sira Certification Service
Rake Lane, Eccleston, Chester, CH4 9JN. England
Tel: +44 (0) 1244 670900 Fax: +44 (0) 1244 681330
Email: exhazard@siratc.co.uk
Sira Certification Service is a service of Sira Test & Certification Ltd

SCHEDULE

EC TYPE-EXAMINATION CERTIFICATE

Sira 01ATEX1295X

13 **DESCRIPTION OF EQUIPMENT**

There are seven models of Purge Controllers intended to provide a given flow rate of purging gas for a predetermined time to unspecified EEx p protected electrical equipment. The MiniPurge Control Units provide one of the following four methods of purge operation.

LC-Leakage compensation only after initial high purge
CF-Continuous flow (same flow rate during and after purging)
CF2-Two flow CF system with initial high purge rate only at one orifice
CFHP-Continuous (lower) flow after initial high purge

MiniPurge Model Number Designation

Typical Model No.:	1	X	LC	cs	DS	SS	AA	MO	FM	OA
Key:	a	b	cc	mm	additional options					

a = Model No

1 = Sub MiniPurge
2 = MiniPurge
3 = Super-MiniPurge
4 = Super-MiniPurge 1800
5 = Super-MiniPurge 3500
6 = Super-MiniPurge 7000
7 = Super-MiniPurge 7000x

b = Pressurization Standard Type

X = ATEX Directive EN 50016, 2nd Edition

cc = Action after initial purge

LC = Leakage compensation only after initial high purge
CF = Continuous flow (same flow rate during and after purging)
CF2 = Two flow CF system with initial high purge rate but only one orifice
CFHP = Continuous (lower) flow after initial high purge

mm = Material of the Control Unit Enclosure

al = Aluminium alloy (<6% light metals e.g. magnesium or titanium)
cs = Mild steel, painted
ss = Stainless steel
nm = Non-Metallic
bp = Back Plate only
co = Chassis only
pm = Panel mounting

Date 3 July 2002

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EC TYPE-EXAMINATION CERTIFICATE

Sira 01ATEX1295X

Additonal Options

Each MiniPurge controller model can also be fitted with the following options, for which there is a separate option code as follows:

AA = Active Alarm output fitted
AC = Alarm cancellation circuit
AO = "Alarm Only" Action on Pressure or Flow Failure
AS = Alarm "Action on Pressure or Flow Failure", Selector Valve
CS = Containment System monitor
DS = Door switch Power Interlock fitted
DT = Delayed Trip after Pressure or Flow failure
FM = Flow Meter(s) fitted
IS = Internal Switches suitable for Ex i circuits
MO = Manual Over-ride fitted
MT = Mechanical Purge or Delay timer
OA = On/Off switch controlling Protective gas and logic supply
OB = On/Off switch controlling logic supply only
OC = On/Off switch controlling Protective gas supply only
OS = Outlet (Orifice) Selector valve
OV = Outlet valve, pneumatically operated
PA = "Ex" switch(es) built-in, with/without "Ex" junction box
PC = PE Pressure Control Leakage Compensation Valve
PO = Pneumatic Output signals for Power and Alarm control
SP = Secondary Pressurisation supply options
SS = Separate Supply for Protective gas and Logic air
TW = Twin (or more) outputs for two or more separate PEs purged in parallel

Relief Valve

The MiniPurge controller is supplied with either an optional overpressure relief valve, which is to be fitted to the EEx p protected apparatus to prevent an internal overpressure above the maximum overpressure rating of the apparatus. There are 14 models of relief valve; the designation of each relief valve refers to its nominal bore in mm, as follows:

RLV3, RLV6, RLV9, RLV12, RLV19, RLV25, RLV26, RLV52, RLV36, RLV75, RLV104, RLV125, RLV150 and RLV200

The outlet of each relief valve is fitted with a spark arrestor, of which there are three optional types as follows:

Metal Foam

Tortuous path, with at least 4 x 90°or 2 x 180° bends

Multi-layer stainless steel mesh

Date 3 July 2002

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Sira 01ATEX1295X

Outlet Orifice

Three types of orifice are used:

Threaded Orifices e.g. ¼" NPT or 2" BSP with a built in spark arrester. These are selected to maintain a desired back pressure within the EEx p protected apparatus when used with the Continuous Flow options. The designation of each outlet orifice indicates the nominal inlet diameter. The designations are as follows:

SA3, SA6, SA9, SA12, SA19, SA25, SA32, SA38 and SA50.

Plain holes in the Relief Valve disk, sized according to the flow rate required.

Replaceable orifice type SAU**.

High Pressure Sensor

The system relief valve may be replaced with a High Pressure Sensor. If the pressure in the purged enclosure rises above the setting of the high pressure sensor the controller resets cutting the power to the purge protected enclosure(s). On detecting the overpressure the optional facility is available for the generation of an alarm or indicator.

System with high pressure sensors will carry the option code HP

Pneumatically Operated Outlet Valve

The pneumatically operated outlet valve is used to positively open or close the outlet of the purged enclosure by means of a spring return pneumatic cylinder.

Systems fitted with the Pneumatically Operated Outlet Valve will carry the option OV.

14 **DESCRIPTIVE DOCUMENTS**

14.1

Drawing	Rev.	Sheet	Date	Title
SD7281	3	1 to 4	02 Jul 02	MiniPurge ATEX Certification Labelling
SD7282	2	1 to 2	21 May 01	MiniPurge ATEX Certification Type Numbering Scheme
EP/99-2-17	1	1 of 1	21 Sep 00	MiniPurge, Continuous Flow with /HP Sensor –Schematic diagram
EP99-7-7	1	1 of 1	21 Sep 00	RLV, outlet orifice
EP99-7-9	1	1 of 1	21 Sep 00	Outlet Valve Control Circuit Diagram

14.2 Report No. R53A7169A

15 **SPECIAL CONDITIONS FOR SAFE USE**

15.1 When the MiniPurge Control Unit is incorporated into equipment, the following considerations shall be included in the assessment of the equipment:

Where applicable, the implications of the operation of the manual override (MO option) and application of appropriate warning labels.

Where applicable, the requirement for an intrinsically safe supply to the switches incorporated in the IS option.

Where applicable, the implications of the operation of the optional alarm indicators and/or signals and application of appropriate warning and identification labels.

Date 3 July 2002

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SCHEDULE

EC TYPE-EXAMINATION CERTIFICATE

Sira 01ATEX1295X

15.2 When using the AO, AS and DT options, the recommendations for the additional requirements of EEx p apparatus contained within EN 60079-14 shall be applied.

15.3 The installer/user shall ensure that the MiniPurge Control Unit is installed in accordance with the equipment certificate that covers the combination of the pressurised enclosure(s) and MiniPurge Control Unit.

15.4 The values of the safety parameters shall be set in accordance with the equipment certificate that covers the combination of the pressurised enclosure(s) and MiniPurge Control Unit.

15.5 This MiniPurge Control Unit shall be incorporated into equipment and the appropriate Conformity Assessment Procedures applied to the combination as defined by Directive 94/9/EC. This certificate is not a certificate that covers the combination.

16 **ESSENTIAL HEALTH AND SAFETY REQUIREMENTS OF ANNEX II** (EHSRs)

The relevant EHSRs that are not addressed by the standards listed in this certificate have been identified and individually assessed in Report No.R53A7169A.

17 **CONDITIONS OF CERTIFICATION**

17.1 The use of this certificate is subject to the Regulations Applicable to Holders of SCS Certificates.

17.2 Holders of EC type-examination certificates are required to comply with the production control requirements defined in Article 8 of directive 94/9/EC.

17.3 The switches incorporated in the PA option shall be suitably certified for Category 2.

17.4 The following routine tests shall be performed by the manufacturer:

Verification of Minimum Overpressure Cut Off

An overpressure loss shall be simulated whilst the MiniPurge Control Unit is cycling, it shall be verified that the controller provides the appropriate output and resets.

Verification of Purge Failure Protection

A purge failure shall be simulated whilst the MiniPurge Control Unit is cycling, it shall be verified that the controller provides the appropriate output and resets.

Verification of Air Supply Failure Protection

An air supply failure shall be simulated whilst the MiniPurge Control Unit is cycling, it shall be verified that the controller provides the appropriate output and resets.

Verification of Purging Overpressure protection

Where the HP is specified an overpressure shall be simulated whilst the MiniPurge Control Unit is cycling, it shall be verified that the controller provides the appropriate output and resets.

Date 3 July 2002

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Sira Certification Service is a service of Sira Test & Certification Ltd

-5 DEC 2002

FM Approvals
1151 Boston-Providence Turnpike
P.O. Box 9102 Norwood, MA 02062 USA
T: 781 762 4300 F: 781 762 9375 www.fmglobal.com

CERTIFICATE OF COMPLIANCE

HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT

This certificate is issued for the following equipment:

Associated Type X Pressurization Apparatus for Class I, Division 1, Groups A, B, C, and D when installed per document M496LC

aXLCbc. Mini-X-Purge Type LC Control System — (EP80-2-11 for Option '/IS')

aXCFHPbc. Mini-X-Purge Type CFHP Control System — (EP80-2-11 for Option '/IS')

Associated Type X Pressurization Apparatus for Class I, Division 1, Groups A, B, C, and D when installed per document M496CF

aXCFbc . Mini-X-Purge Type CF Control System — (EP80-2-11 for Option '/IS')

Associated Type Y Pressurization Apparatus for Class I, Division 1, Groups A, B, C, and D when installed per document M496LC

aYLCbc. Mini-Y-Purge Type LC Control System — (EP80-2-11 for Option '/IS')

aYCFHPbc. Mini-Y-Purge Type CFHP Control System — (EP80-2-11 for Option '/IS')

Associated Type Y Pressurization Apparatus for Class I, Division 1, Groups A, B, C, and D when installed per document M496CF

aYCFbc. Mini-Y-Purge Type CF Control System — (EP80-2-11 for Option '/IS')

Associated Type Z Pressurization Apparatus for Class I, Division 2, Groups A, B, C, and D when installed per document M496LC

aZLCbc. Mini-Z-Purge Type LC Control System — (EP80-2-11 for Option '/IS')

aZCFHPbc. Mini-Z-Purge Type CFHP Control System — (EP80-2-11 for Option '/IS')

Associated Type Z Pressurization Apparatus for Class I, Division 2, Groups A, B, C, and D when installed per document M496CF

aZCFbc. Mini-Z-Purge Type CF Control System — (EP80-2-11 for Option '/IS')

Associated Type X Pressurization Apparatus for Class II, Division 1, Groups E, F, & G when installed per document M496DP

aXDPbc. Mini-X-Purge Type DP Control System — (EP80-2-11 for Option '/IS')

Associated Type Y Pressurization Apparatus for Class II, Division 1, Groups E, F, & G when installed per document M496DP

aYDPbc. Mini-Y-Purge Type DP Control System — (EP80-2-11 for Option '/IS')

Associated Type Z Pressurization Apparatus for Class II, Division 2, Groups F & G when installed per document M496DP

aZDPbc. Mini-Z-Purge Type DP Control System — (EP80-2-11 for Option '/IS')

where:
a = Model size 1, 2, 3, 4, 5, or 6
b = Enclosure material cs, ss, bp, or nm
c = Option code AA, AC, AO, AS, CT, DS, DT, FM, IS, MO, MT, NO, OA, OB, OC, OS, PC, SS, TW, and/or **

** denotes special, non-Approval related options such as color or enclosure mounting arrangements.

☞ All LC Systems must include an RLV Series Relief Valve matched to the specific control system.

☞ All CF and CFHP Systems must include an RLV Series Relief Valve matched to the specific control system with either an internal or separate Outlet Orifice.

RLVabcd. Relief Valve

a = Vent size 3, 6, 9, 12, 19, 25, 36, 52, 75, or 104.
b = Option code Blank, CF + (size in mm) and/or FS.
c = Casing material cs, ss, or br.
d = Thread type NPT, BSP, Metric Pipe, API, or Pg.

SAabc. Outlet Orifice / Spark Arrestor

a = Nominal size 3, 6, 9, 12, 19, 25, 32, 38, or 50
b = Casing material cs or ss
c = Thread type NPT, BSP, Metric Pipe, API, or Pg

SAUa. Outlet Orifice / Spark Arrestor - Universal

a = Nominal size 25, 32, or 50

Equipment Ratings:

Control Apparatus Associated with Pressurized Electrical Equipment for hazardous (classified) locations.

Approved for:

Expo Telektron Safety Systems Ltd.
Summer Road
Thames Ditton, Surrey KT7 0RH
United Kingdom

This certifies that the equipment described has been found to comply with the following FM Approval Standards and other documents:

Class 3600	1998
Class 3620	2000

Original Project ID: 1X8A4.AE FM Approval Granted: April 8, 1994

Subsequent Revision Reports / Date FM Approval Amended

Report Number	Date	Report Number	Date
0B3A3.AE	November 5, 1996	3010469	June 25, 2001

FM Global Technologies LLC

Andrew Lozinski
Technical Team Manager

November 27, 200
Date

An FM Global Enterprise

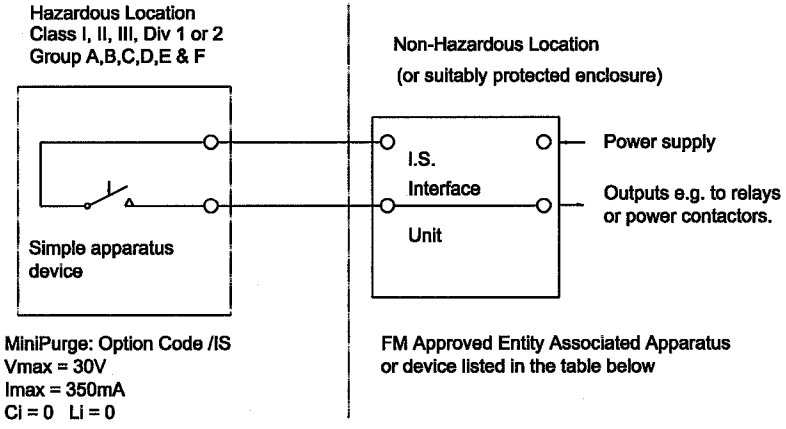
3rd ANGLE PROJECTION

DIMENSIONS IN mm. UNSPECIFIED TOLERANCES NO DEC. PLACE ±0.5, 1 DEC. PLACE ±0.2, 2 DEC. PLACE ±0.1

FLATNESS TO BE LESS THAN 0.4mm OVER ANY 100mm LENGTH

The contents of this Drawing/Document are copyright. They are to be treated as confidential and are returnable upon request. They are not to be copied communicated in part or whole without written consent from Expo Telektron Safety Systems Ltd. Neither are they to be used in any way against our interests.

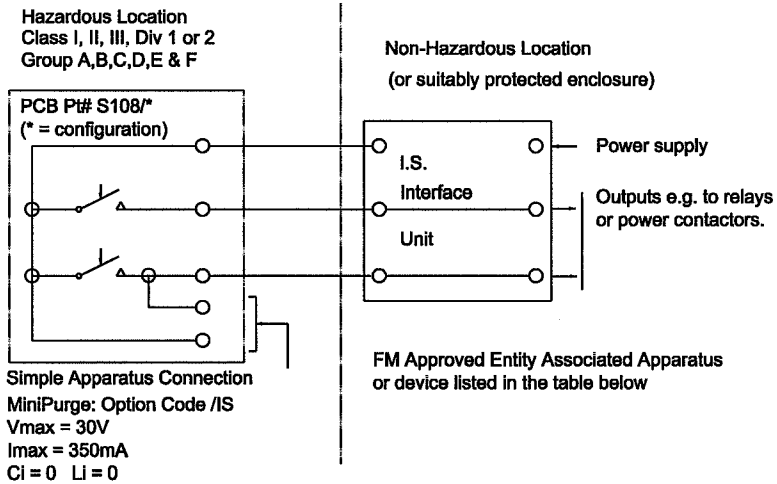
Fig 1a Single channel interface circuit
e.g. "Y" or "Z" Pressurization Alarm circuit



MiniPurge: Option Code /IS
Vmax = 30V
Imax = 350mA
Ci = 0 Li = 0

FM Approved Entity Associated Apparatus or device listed in the table below

Fig 1b Multi-channel interface circuit
e.g. "X" pressurization Alarm & Power Control



Simple Apparatus Connection
MiniPurge: Option Code /IS
Vmax = 30V
Imax = 350mA
Ci = 0 Li = 0

FM Approved Entity Associated Apparatus or device listed in the table below

Notes for both Fig 1a and Fig 1b

1 Electrical equipment connected to associated apparatus should not use or generate more than 250 volts
2 Installation shall be in accordance with the manufacturer's instructions and the National Electrical Code (ANSI/NFPA 70)
3 For guidance on Installation see ANSI/ISA RP12.6, (Installation of IS Instrument Systems in Class I Hazardous Locations)
4 Voc or Vt of associated apparatus is less than Vmax
Isc or It of associated apparatus is less than Imax
Ci plus capacitance of interconnecting cabling is less than Ca of the associated apparatus
Li plus inductance of interconnecting cabling is less than La of the associated apparatus
5 "Simple Apparatus" is a device that will not generate or store more than 1.2V, 0.1A, 25mW or 20uJ

Manufacturer	Model	IS Output	Classification
Gems Sensors	44075		Class I, II Div 1 Grp A,B,C,D,E,F&G
Gems Sensors	64101		Class I, II Div 1 Grp A,B,C,D,E,F&G
Gems Sensors	144600		Class I, II Div 1 Grp A,B,C,D,E,F&G
Gems Sensors	25874		Class I, II Div 1 Grp A,B,C,D,E,F&G
Gems Sensors	25872		Class I, II Div 1 Grp A,B,C,D,E,F&G
Gems Sensors	54820		Class I, II Div 1 Grp A,B,C,D,E,F&G
Gems Sensors	54825		Class I, II Div 1 Grp A,B,C,D,E,F&G
Gems Sensors	54845		Class I, II Div 1 Grp A,B,C,D,E,F&G

Manufacturer	Model	IS Output	Classification
Gems Sensors	64101		Class I, II Div 1 Grp A,B,C,D,E,F&G

DO NOT SCALE

APP'D		ISSUE:-	1				MAT'L	FINISH
CHK'D		MOD. No:-	DRAWN					
		DATE:-	23.7.96					
DRN	AMO	APPROVED:-						
		DRAWING STATUS: CERT RELATED					DRG FILE:	

Expo Telektron Safety Systems Ltd SURREY, ENGLAND

TITLE: MINIPURGE OPTION 'IS'

JOB No:

CUSTOMER:

SCALE N.T.S

DRG. No. EP80-2-11

SHT. No. 1 OF 1

333 Pfingsten Road
Northbrook, Illinois 60062-2096
United States Country Code(1)
(847) 272-8800
FAX No. (847) 272-8129
http://www.ul.com

Underwriters Laboratories Inc.®

File E190061 Vol 1 Issued 1999-07-23
Revised 2003-05-08

FOLLOW-UP SERVICE PROCEDURE
(TYPE R)

PURGING AND PRESSURIZING CONTROLS AND
ACCESSORIES FOR USE IN HAZARDOUS LOCATIONS
(RFPW,RFPW7)

Manufacturer: (466459-001)
EXPO TECHNOLOGIES LIMITED
SUMMER RD
THAMES DITTON
SURREY
KT7 0RH ENGLAND UNITED KINGDOM

Applicant: (466459-001)
SAME AS MANUFACTURER

Classified Company: (466459-001)
SAME AS MANUFACTURER

This Procedure authorizes the above Manufacturer to use the marking specified by Underwriters Laboratories Inc. only on products covered by this Procedure, in accordance with the applicable Follow-Up Service Agreement.

The prescribed Mark or Marking shall be used only at the above manufacturing location on such products which comply with this Procedure and any other applicable requirements.

The Procedure contains information for the use of the above named Manufacturer and representatives of Underwriters Laboratories Inc. and is not to be used for any other purpose. It is lent to the Manufacturer with the understanding that it is not to be copied, either wholly or in part, and that it will be returned to Underwriters Laboratories Inc. upon request.

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UNDERWRITERS LABORATORIES INC.

A.W. Schaefer
Vice President and General Manager
US and Canadian Operations

A

A not-for-profit organization
dedicated to public safety and
committed to quality service

1 # EC - TYPE EXAMINATION CERTIFICATE

2 **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres Directive 94/9/EC**

3	EC - Type Examination Certificate Number:	**Baseefa04ATEX0218**
4	Equipment or Protective System:	**Type MIU B/e P1827 Minipurge Interface Unit**
5	Manufacturer:	**Expo Technologies Limited**
6	Address:	**Summer Road, Thames Ditton, Surrey, KT7 0RH**

7 This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 Baseefa (2001) Ltd. Notified body number 1180, in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in confidential Report No. **04(C)0442**

9 Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50014: 1997 + Amendments 1 & 2
EN 50019: 2000
EN 50281-1-1: 1998 + Amendment 1

except in respect of those requirements listed at item 18 of the Schedule.

10 If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

11 This EC - TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified equipment or protective system. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.

12 The marking of the equipment or protective system shall include the following :

⟨Ex⟩ II 2GD EEx e II T100°C (T_{amb} -20°C to + 55°C) IP64

This certificate may only be reproduced in its entirety, without any change, schedule included.

Baseefa (2001) Ltd. Customer Reference No. **0379**

Project File No. **04/0442**

This certificate is granted subject to the general terms and conditions of Baseefa (2001) Ltd. It does not necessarily indicate that the equipment may be used in particular industries or circumstances.

Baseefa (2001) Ltd.
Health and Safety Laboratory Site, Harpur Hill,
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R S SINCLAIR
DIRECTOR
On behalf of
Baseefa (2001) Ltd.

13 # Schedule

14 ## Certificate Number Baseefa04ATEX0218

15 Description of Equipment or Protective System

The **Type MIU B/e P1827 Minipurge Interface Unit** is rated up to 550V, 10A and comprises a Type PE2 Enclosure, manufactured in stainless steel by Expo Technologies Limited to EC Type Examination Certificate No. Sira 01ATEX1157U.

The enclosure is used to house up to twenty terminals, of Type WDU2.5 or TypeWPE2.5 or a combination thereof, manufactured by Weidmuller GmbH to EC Type Examination Certificate No. KEMA 98ATEX1683U.

Variation 0.1

An alternative **Type MIU B/e P1813 Minipurge Interface Unit** comprising a smaller enclosure, to the certificate as above, and containing only ten terminals, certified as above.

16 Report Number

Baseefa Certification Report No. 04(C)0442

17 Special Conditions for Safe Use

None

18 Essential Health and Safety Requirements

All relevant Essential Health and Safety Requirements are covered by the standards listed at item 9.

19 Drawings and Documents

Number	Issue	Date	Description
SD7464	2	08.06.2004	General Arrangement, Type MIU B/e P1827 Minipurge Interface Unit
SD7466	1	11.06.2004	General Arrangement, Type MIU B/e P1813 Minipurge Interface Unit

MiniPurge Interface Unit ATEX Certification
User Instruction Manual

Certification Data:

Manufacturer:	Expo Technologies Ltd, Thames Ditton, Surrey, UK
Hazardous Area Marking Code:	EEx e II T100°C IP64
	CE 0518 Ex II 2 G D
	Tamb -20°C to +55°C
Type:	MIU B/e P1827 or MIU B/e P1813
Certificate Number:	Baseefa04ATEX0218
Rating :	550V 10A
Serial Number:	YYYY/XZZZZZ
	YYYY = year of manufacture (i.e. 2004)
	XZZZZZ = serial number (i.e. M50031)

Application Suitability:

MiniPurge Interface Units are certified for use in Hazardous Areas where the Hazardous Area is non-mining (i.e. above ground) and the hazard is caused by flammable gasses or vapours.
The systems may be used in Zone 1 and Zone 2 Hazardous Areas. (ATEX Category 2 and 3 respectively.)
MiniPurge Interface Unit may be used for hazards of any gas group.
The following materials are used in the construction of MiniPurge Interface Units. If substances that will adversely affect any of these materials are present in the surrounding environment, please consult Expo Technologies for further guidance. This equipment is designed for use under normal industrial conditions of ambient temperature, humidity and vibration. Please consult Expo Technologies before installing this equipment in conditions that may cause stresses beyond normal industrial conditions

Materials of construction: Stainless Steel, Steel, Brass, Copper, Polyamide, PVC.

Only install commission, inspect, maintain or fault find when safe to do so.

Installation:

The MiniPurge Interface Unit shall be installed in accordance with relevant standards, such as EN 60 079-14, and any local codes of practice that are in force. Cable glands or other cable entry devices shall be appropriately certified and suitable for the cable and the conditions of use and be installed in accordance with the manufacturer's instructions. EN 60 079-14 contains guidance on the selection of appropriate cable glands.
The MiniPurge Interface Unit shall be connected to the MiniPurge Purge and Pressurization system in accordance with the instructions given in the handbook supplied with the pressurization system.
The external earth connection of the MiniPurge Interface unit shall be connected to earth using a minimum $4mm^2$ conductor.

Contact Terminals

For Type 1827 maximum x20 WDU2.5 or WPE2.5 earth terminals certified to KEMA98ATEX1683.
For Type 1813 maximum x10 WDU2.5 or WPE2.5 earth terminals certified to KEMA98ATEX1683.

Commissioning (Putting into use)

The installation of the cable glands, electrical and earth connections shall be inspected for correct installation before the unit is put into service. The lid shall be correctly fitted.

Maintenance

The condition of enclosure and associated cable glands shall be inspected for damage periodically. The terminals inspected for tightness and gaskets inspected for damage.

Fault Finding

If a wiring or signal fault occurs, check each terminated wire, terminals for tightness and gaskets for damage. External faults such as broken switches within the Control Unit may also require investigation.

Drawings and Diagrams

Refer to the manual supplied with the Control Unit for assembly and connection drawings.

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

PTB

(1) # EC-TYPE-EXAMINATION CERTIFICATE

(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**

(3) EC-type-examination Certificate Number:

PTB 00 ATEX 1093 X

(4) Equipment: Limit switch, type 07-25.1-..../....

(5) Manufacturer: BARTEC Componenten und Systeme GmbH

(6) Address: D-97980 Bad Mergentheim

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report PTB Ex 00-10203.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50014:1997 EN 50018:1994

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type-examination Certificate relates only to the design and construction of the specified equipment in accordance with Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and supply of this equipment.

(12) The marking of the equipment shall include the following:

Ex II 2 G EEx d IIC T6 or T5

Zertifizierungsstelle Explosionsschutz

By order

Braunschweig, December 7, 2000

Dr.-Ing. U. Klausmeyer
Regierungsdirektor

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.
In case of dispute, the German text shall prevail.

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • D-38116 Braunschweig

(13) # SCHEDULE

(14) ## EC-TYPE-EXAMINATION CERTIFICATE PTB 00 ATEX 1093 X

(15) Description of equipment

The limit switch of type 07-25.1-..../.... is used as an auxiliary switch for signal and control circuits. It will comprise one or two interrupting chambers and housings differing in their thermal resistance.

Connection is provided by means of an encapsulated connecting cable (open ended line).

Technical data

Rated insulation voltage *) ..... up to	500 V	
	Type 07-2511-..../.... and type 07-2581-..../....	
Rated operating voltage U_e	400 V	250 V
Rated current I_e ..... max.	2 A	0.15 A
Related to utilization category	AC-15	DC-13
	Type 07-2521-..1./.... to 07-25221-..4./....	
Rated operating voltage U_e	250 V	250 V
Rated current I_e ..... max.	5 A	0.4 A
Related to utilization category	AC-15	DC-13
	Type 07-2521-..6./....	
Rated operating voltage U_e	250 V	250 V
Rated current I_e ..... max.	2 A	0.4 A
Related to utilization category	AC-15	DC-13
	Type 07-2521-..7./.....	
Rated operating voltage U_e	400 V	250 V
Rated current I_e ..... max.	2 A	0.4 A
Related to utilization category	AC-15	DC-13
	Type 07-2521-..8./....	
Rated operating voltage U_e	500 V	250 V
Rated current I_e ..... max.	2 A	0.4 A
Related to utilization category	AC-15	DC-13

*) *depending on connecting cable used*

Provided the making and breaking capacity complies with the relevant conditions, rated values other than those specified above are accepted and will be defined by the manufacturer on the basis of the operating mode, utilization category, etc.

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Contacts depending on switching module	1 or 2 changeover contacts or 1 break and/or 1 make contact, 1 or 2 break contacts with positive opening operation			
Temperature	≤60 °C	70 °C	75 °C	90 °C
Temperature class		T6		
Type 07-2511-..X0/.... and 07-2581-..X0/.... Rated thermal current	7 A	--	3 A	--
Type 07-2511-..XX/.... and 07-2581-..XX/.... Rated thermal current	6 A	--	2 A	--
Temperature class	T6	T5	T6	T5
Type 07-2521-..X0/.... Rated thermal current	5 A	8 A	3 A	3 A
Type 07-2521-..XX/.... Rated thermal current	5 A	6 A	2 A	2 A

The limit switches of type 07-2511- and 07-2581- are designed for a temperature resistance of -55 °C to 100 °C.

The limit switch of type 07-2521- is designed for a temperature resistance of -20 °C to 115 °C.

Nominal conductor cross section ..... 2 to 8 x 1.5 mm²

(16) Test report PTB Ex 00-10203

(17) Special conditions for safe use

The limit switch shall be installed so as to provide for mechanical protection against impact energy in accordance with EN 50014 section 23.4.3.1.

The quality of the connecting cable shall satisfy the thermal and mechanical requirements within the functional range.

This EC type-examination certificate as well as any future supplements thereto shall at the same time be regarded as supplements to Certificate of Conformity PTB No. Ex-91.C.1083 X.

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In case of dispute, the German text shall prevail.

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(18) Essential health and safety requirements

The tests and the favourable results these have produced reveal that the limit switch meets the requirements of directive 94/9/EC as well as those of the standards quoted on the cover sheet.

Zertifizierungsstelle Explosionsschutz
By order:

Dr.-Ing. U. Klausmeyer
Regierungsdirektor

Braunschweig, December 7, 2000

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.
In case of dispute, the German text shall prevail.

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VS-7037N
Revised 09-06
Section 20
(00-02-0185)

Shock/Vibration Control Switches Installation Instructions

Models: VS2, VS2C, VS2EX, VS2EXR, VS2EXRB and VS94

MURPHY

Please read the following instructions before installing. A visual inspection of this product for damage during shipping is recommended before mounting. It is your responsibility to have a qualified person install the unit, and make sure installation conforms with NEC and local codes.

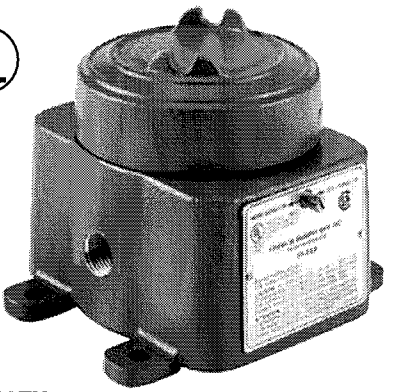
GENERAL INFORMATION

WARNING

BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT

- ✔ Disconnect all electrical power to the machine.
- ✔ Make sure the machine cannot operate during installation.
- ✔ Follow all safety warnings of the machine manufacturer.
- ✔ Read and follow all installation instructions.

LISTED*



Model VS2EX

Description

The Murphy shock and vibration switches are available in a variety of models for applications on machinery or equipment where excessive vibration or shock can damage the equipment or otherwise poses a threat to safe operation. A set of contacts is held in a latched position through a mechanical latch and magnet mechanism. As the level of vibration or shock increases an inertia mass exerts force against the latch arm and forces it away from the magnetic latch causing the latch arm to operate the contacts. Sensitivity is obtained by adjusting the amount of the air gap between the magnet and the latch arm plate.

Applications include all types of rotating or reciprocating machinery such as cooling fans, engines, pumps, compressors, pump jacks, etc.

Models

VS2: Base mount; non hazardous locations.

VS2C: C-clamp mount; non hazardous locations.

VS2EX: Explosion-proof; Class I, Div. 1, Groups C and D.

VS2EXR: Explosion-proof with remote reset.

VS2EXRB: Explosion-proof; Class I, Div. 1, Group B; with remote reset.

VS94: Base mount; non hazardous locations, NEMA 4X/IP66.

Remote Reset Feature (VS2EXR, VS2EXRB and VS94 only)

Includes built-in electric solenoid which allows reset of tripped unit from a remote location. Standard on VS2EXR and VS2EXRB. Optional on VS94 (options listed below).

-R15: Remote reset for 115 VAC

-R24: Remote reset for 24 VDC

Time Delay Option (VS94 only)

Overrides trip operation on start-up. For VS94 series models, the delay time is field-adjustable from 5 seconds up to 100 seconds with a 20-turn potentiometer (5 seconds per turn approximately). Options listed below:

-T15: Time delay for 115 VAC

-T24: Time delay for 24 VDC

Space Heater Options (VS94 only)

This optional space heater board prevents moisture from condensing inside the VS94 Series case. Options listed below:

-H15: Space heater for 115 VAC

-H24: Space heater for 24 VDC

Warranty

A limited warranty on materials and workmanship is given with this FW Murphy product. A copy of the warranty may be viewed or printed by going to www.fwmurphy.com/support/warranty.htm

CERTIFICATE OF ORIGIN

Equipment:	Centrifuge
Model:	DE-1000™ GBD, DE-1000™ FHD, DE-1000™ VFD
Characteristics:	0-600VAC, 50/60Hz, 3PH

Derrick Corporation acknowledges that the above set-forth product is manufactured in the United States of America as of the data of this certificate. This certificate is governed by the applicable purchase order terms in effect at the time of Derrick Corporation's original shipment of the referenced product.

Date: 29-December-2011

Signature: Jennifer J. Polanowski
Derrick Corporation

DERRICK® CORPORATION

CERTIFICATE OF QUALITY

Equipment:	Centrifuges
Model:	DE-1000™ GBD, DE-1000™ FHD, DE-1000™ VFD, DE-7200 VFD
Characteristics:	0-600VAC, 50/60Hz, 3PH

Derrick Corporation acknowledges that the above set-forth product conformed to the requirements for the applicable purchase order at the time of its original shipment by Derrick Corporation in that all construction materials and components were new and unused, were manufactured for this product, and that it was free of any known defects as to their design, material and workmanship. This certificate is governed by the applicable purchase order terms in effect at the time of Derrick Corporation's original shipment of the referenced product.

Jennifer J. Polanowski

Date: 29-December-2011

Signature: Jennifer J. Polanowski
Derrick Corporation

SHIPPING FINAL INSPECTION AND RUN TEST CERTIFICATE

Equipment:	Centrifuges
Model:	DE-1000™ GBD, DE-1000™ FHD, DE-1000™ VFD, DE-7200 VFD
Characteristics:	0-600VAC, 50/60Hz, 3PH

The product listed above was inspected and found to be in conformance with Derrick Corporation's internal coating, run test, and assembly inspection documents that were required for the type of equipment manufactured in accordance with the Derrick quality system. This certificate is governed by the applicable purchase order terms in effect at the time of Derrick Corporation's original shipment of the referenced product.

Date: 29-December-2011

Signature: Jennifer J. Polanowski
Derrick Corporation

Doc # PE-S-036-02-06
Date: 20-January-2011

CERTIFICATE OF CONFORMANCE

Equipment:	Mining & Oilfield equipment manufactured specifically for Hazardous Location Areas including but not limited to: Flo-Line® Cleaners, Flo-Line® Primers, Agitators, Vacu-Flo™ Degassers, DE-1000™ Centrifuges, Centrifugal Pumps, Flo-Line Scalpers™ etc.
Name and Address of Manufacturer:	Derrick Corporation 590 Duke Road Buffalo, NY 14225
Rating and Principle Characteristics:	0-600 VAC, 50/60Hz, 3PH
Model / Type Ref:	Various
Additional Information:	None

This product was found to be in conformance with:

U.L. listed for hazardous locations Class I, Division 1, Groups C & D, which is similar to equipment marked as II 2G Ex d IIB T3 for Zone 1 areas. Assembled in accordance with National Electrical Code (NEC) – articles 500 thru 506 (hazardous locations) where applicable.

Additionally:

Derrick Corporation certifies that the above-listed equipment for the referenced order conformed to the requirements of the specified order at the time of its original shipment by Derrick Corporation in that: all construction materials and components were new and unused, manufactured for this equipment, and that the goods were free of any known defects as to their design, material and workmanship. This certificate is governed by the applicable purchase order terms in effect at the time of Derrick Corporation's original shipment of the above-listed equipment.

DERRICK CORP. JAN 19 2012 ENGINEERING DEPT.

Signature: For Thomas Silvestrini